Session 1.2 Processes for Implementing Standards - Europe, Japan and USA

Paper 121

Processes for Implementing Standards - Europe

Carl-Herbert Rokitansky

ITS Standards Program Review and Interoperability Workshop

"European and International Standards in Dedicated Short-Range Communications (DSRC) to support New Services in Telematics"

Dr. Carl-Herbert Rokitansky

RWTH Aachen / Communication Networks

D-52074 Aachen; Kopernikusstr. 16
Tel: +49-241-807924; +49-I 72-241 04 71 (GSM);
Fax: +49-241-8888-242; Email: roki@comnets.rwth-aachen.de

Convenor of CEN / TC 278 / WG9
Convenor of IS0 / TC 204 / WGI5

"European and International Standards in Dedicated Short-Range Communications (DSRC) to support New Services in Telematics"
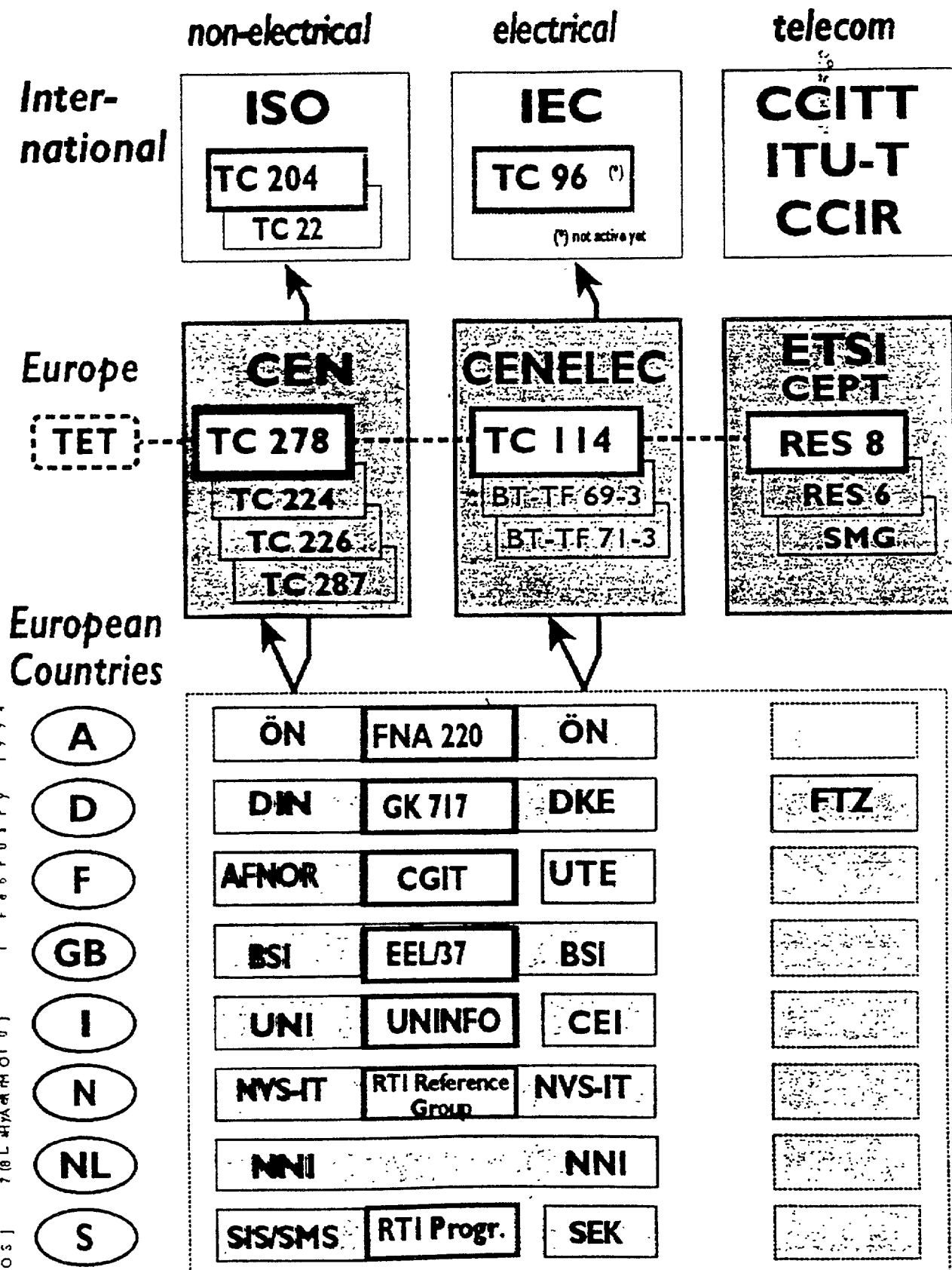
Dr. Carl-Herbert Rokitansky

- **Introduction**

- **New Services which will be supported by DSRC**

- **CEN Dedicated Short-Range Communications (DSRC) Standards**

- **Validation of DSRC**

- **Status of CEN DSRC ENV Standards (CEN / TC 278 / WG9)**

- **Status of IS0 DSRC Standardisation (IS0 / TC 204 / WGI5)**

- **Co-existence of CEN DSRC Standard Systems with Existing EFC Systems**
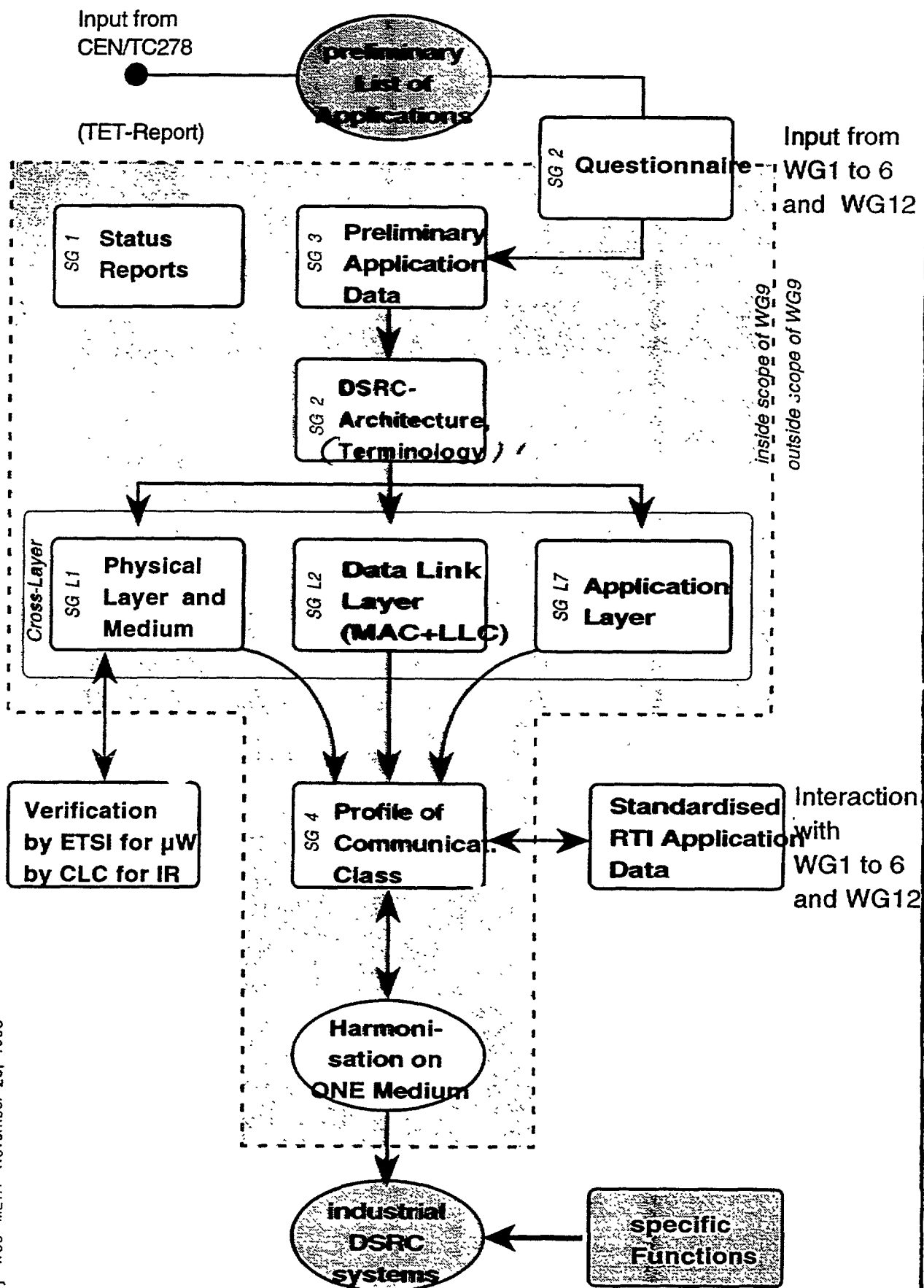
- **Conclusions**

New Services in Telematics for Mobility:

- **Electronic Fee Collection (EFC)**
- **Access Control**
- **Ecopoint System (Austria)**
- **Traffic and Traveller Information**
- **Public Transport**
- **Variable Message Signs**
- **Congestion and Emergency Warning**
- **Freight & Fleet Management**
- **Parking Management**
- **etc.**

Road Transport Telematics (RTT) Standardisation Activity Summary

	non-electrical	electrical	telecom
Inter-national	**ISO** TC 204 / TC 22	**IEC** TC 96 (*) (*) not active yet	**CCITT ITU-T CCIR**
Europe	**CEN** TC 278 / TC 224 / TC 226 / TC 287	**CENELEC** TC 114 / BT-TF 69-3 / BT-TF 71-3	**ETSI CEPT** RES 8 / RES 6 / SMG

TET ·········· TC 278 ·········· TC 114 ·········· RES 8

European Countries

	non-electrical		electrical	telecom
A	ÖN	FNA 220	ÖN	
D	DIN	GK 717	DKE	FTZ
F	AFNOR	CGIT	UTE	
GB	BSI	EEL/37	BSI	
I	UNI	UNINFO	CEI	
N	NVS-IT	RTI Reference Group	NVS-IT	
NL	NNI		NNI	
S	SIS/SMS	RTI Progr.	SEK	

[KOSI] 7(8L+HYA&MOI 0)

CEN/TC278/WG9 "DSRC" : Methodology of Work

Input from
CEN/TC278

(TET-Report)

preliminary List of Applications

SG 2 **Questionnaire**

Input from
WG1 to 6
and WG12

SG 1 **Status Reports**

SG 3 **Preliminary Application Data**

inside scope of WG9

outside scope of WG9

SG 2 **DSRC-Architecture (Terminology)**

Cross-Layer

SG L1 **Physical Layer and Medium**

SG L2 **Data Link Layer (MAC+LLC)**

SG L7 **Application Layer**

Verification by ETSI for µW by CLC for IR

SG 4 **Profile of Communicat. Class**

Standardised RTI Application Data

Interaction with
WG1 to 6
and WG12

Harmoni-sation on ONE Medium

industrial DSRC systems

specific Functions

[KOS] WG9–METH November 25, 1993

Background

Milestones in DSRC standardization

Oct.1992: Establishment of CEN TC 278 / WG9 "Dedicated Short Range Communications"

1992: Definition of DSRC Methodology

1993: Development of DSRC Layer Functions

1995: **Completion of DSRC prENV Standard proposals**

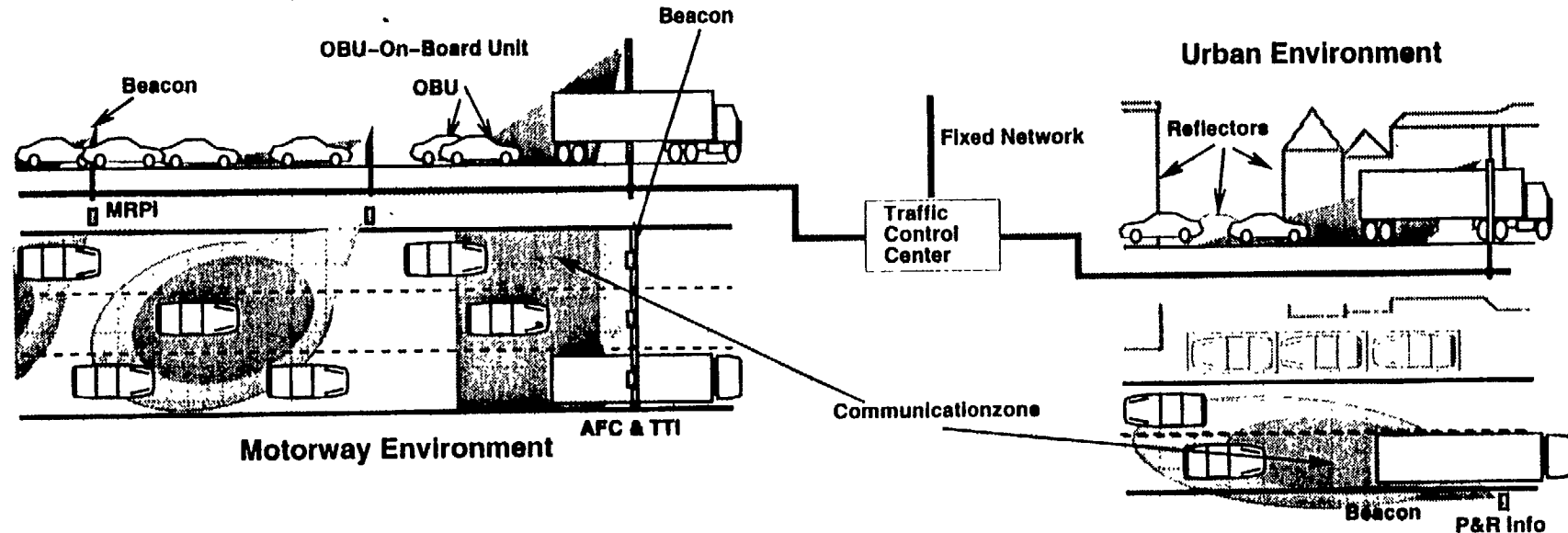**1996:** Definition of DSRC Layer Communication Profiles

DSRC communication architecture

Beacon
Application Processes
Automatic Fee Collection
Traffic & Traveller Info
etc.

Vehicle
Application Processes
Automatic Fee Collection
Traffic & Traveller Info
etc.

Application Layer — Application Data Unit — Application Layer

Logical Link Control — LLC Data Unit — Logical Link Control

Medium Access Control — Medium Access Control

Physical Layer — Frame — Physical Layer

Bit

Modulated Medium

Validation of Dedicated Short-Range Communications VASCO

Vehicle-Roadside Communications

- **Decentralised system concept:** Distribution and collection of data in a local environment

- **Typical applications**
  - Electronic Fee Collection (EFC)
  - Traffic & Traveller Information (TTI)

- **OBU-Localisation is possible within certain margins**

- **European Standardisation** (CEN TC 278 WG 9, 1992-1996) as:

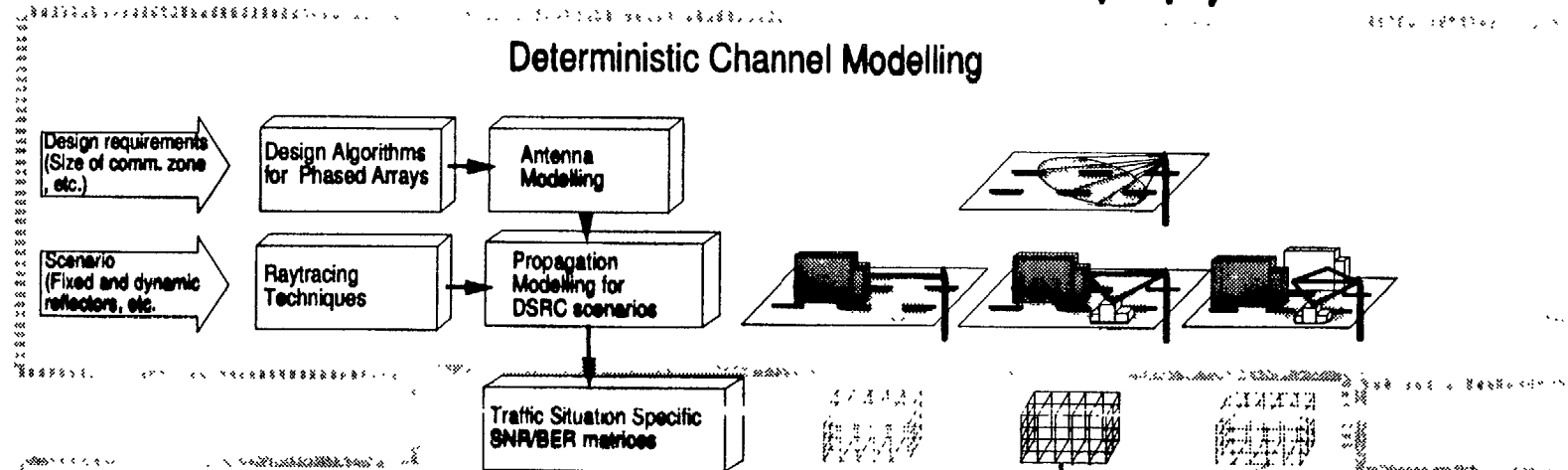 **Dedicated Short-Range Communications (DSRC)**

Typical DSRC Communication Process

- **DSRC Communication Architecture:**
  Physical Layer, Data Link Layer and Application Layer

- **TDMA**, half duplex, Master (Beacon) - Slave (OBU)

- **Beacon Service Table BST**: Reservation for **'Public Windows'** and lists of the offered applications

- For registration the OBU allocates a 'Public Window' using a **random delay counter mechanism** :
  - Public Window with always w Slots
  - Allocation follows randomly within R slots

- While the transaction takes place the Beacon assigns individually addressed **'Private Windows'**.

- Example: Interactive dialog

Public Window   Private Window   Private Window

DL   BST   BST   PrReq   TrRq   BST   POLL   TrAck   BST

UL   PrRsp   TrRsp

VST   Debit Request (6ms)   ICC-Operation (40 ms)   Confirmation (6 ms)

Registration   Application 'Automatic Fee Collection'

Zeit

DL – Downlink, i.e. Beacon – OBU   BST – Beacon Service Table   OBU–On–Board Unit (Vehicle Communication Device)
UL – Uplink, i.e. OBU – Beacon   VST – Vehicle Service Table
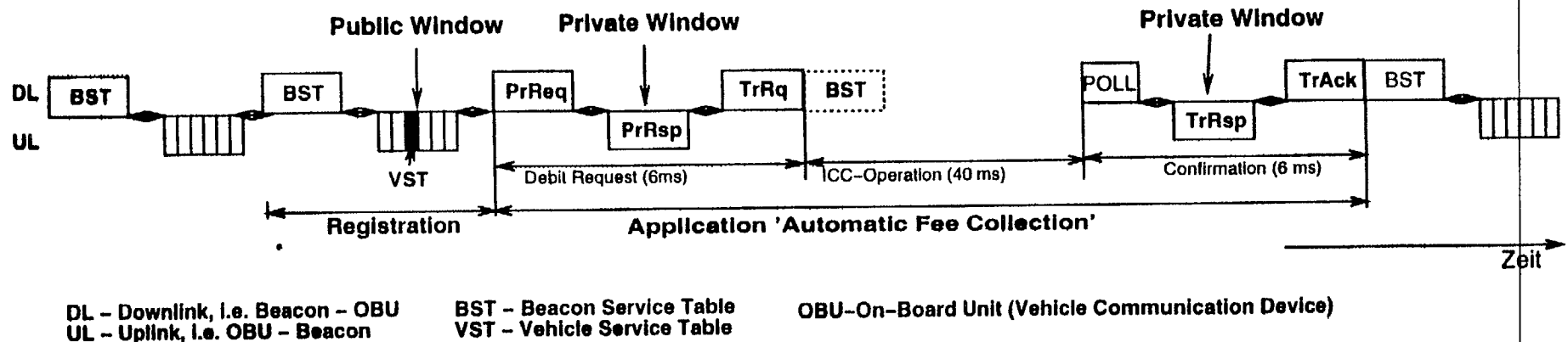
Systemsimulation SIMCO3++/DSRC

Deterministic Channel Modelling

Design requirements (Size of comm. zone , etc.) → Design Algorithms for Phased Arrays → Antenna Modelling

Scenario (Fixed and dynamic reflectors, etc. → Raytracing Techniques → Propagation Modelling for DSRC scenarios

Traffic Situation Specific SNR/BER matrices

Access on channel data base depending on traffic situation

Protocol requirements → Formal Specification and Conformance Testing → Translation from SDL to CNCL → On-Board Communication Architecture ← Dynamic DSRC Channel Model → Roadside Communication Architecture

Measurement data (optional)

Traffic Statistics → Vehicle Generator

Vehicle Mobility
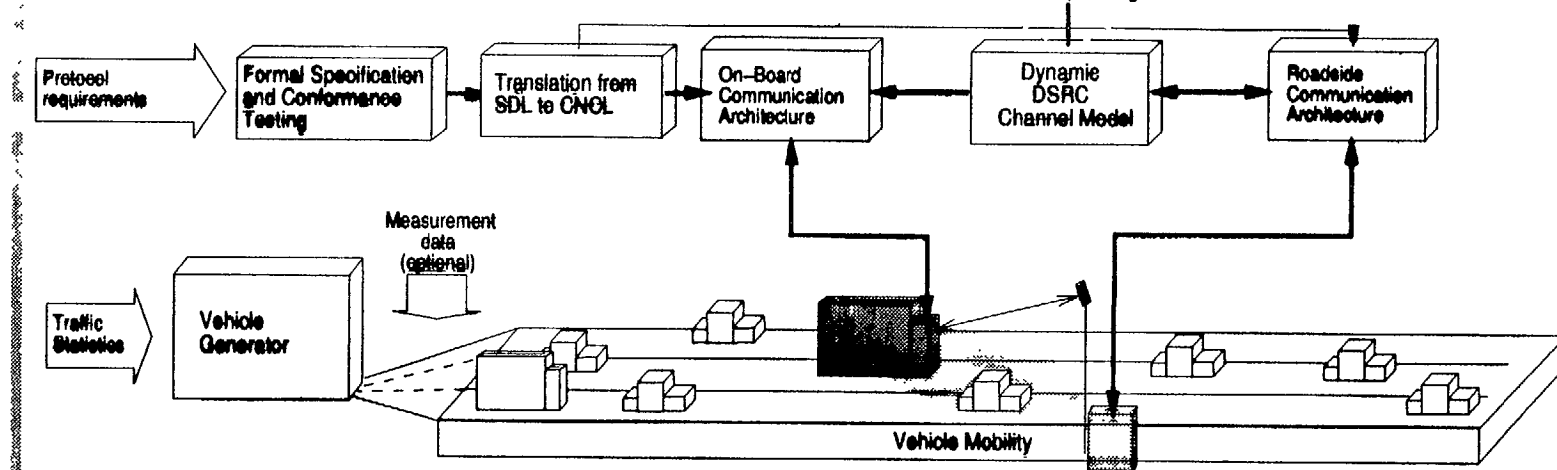
Stochastic Simulation Model

System Simulation SIMCO3++

ComNets Class Library

| Random Number Generation | Statistical Evaluation | Event Handling |

SIMCO3++

Roadside Infrastructure

Scenarios

Driver Behaviour

Traffic Statistics

Weather Conditions

Communication Protocols

Mobility Model

Channel Model

SDL

SDL

Application Standards

DSRC Draft Standards

Antenna Characteristics

Propagation Modelling

Transmission Medium

System Performance

Performance of Communication Protocols

Optimization of Parameter Settings

Microscopic Traffic Model: Validation

Relevant traffic characteristics for performance evaluation:

- Intensity and Interarrival times → traffic load for communication protocols
- Headway distributions → shadowing effects
- speed distributions → available transaction time

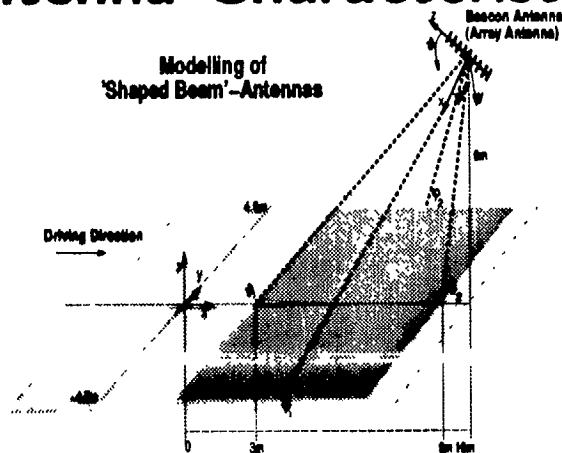## Validation of mobility model: Interarrival times

measurement vs. simulation
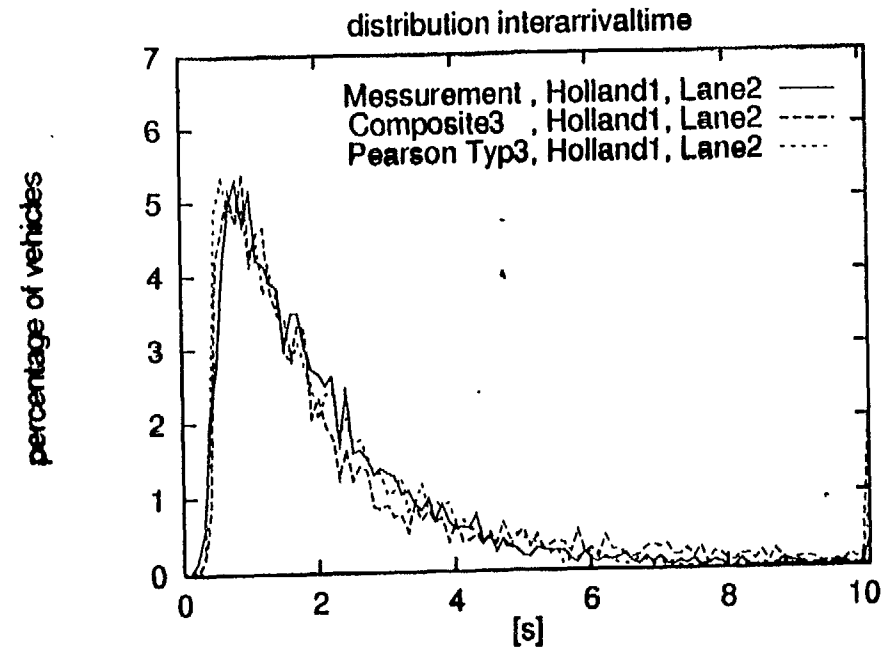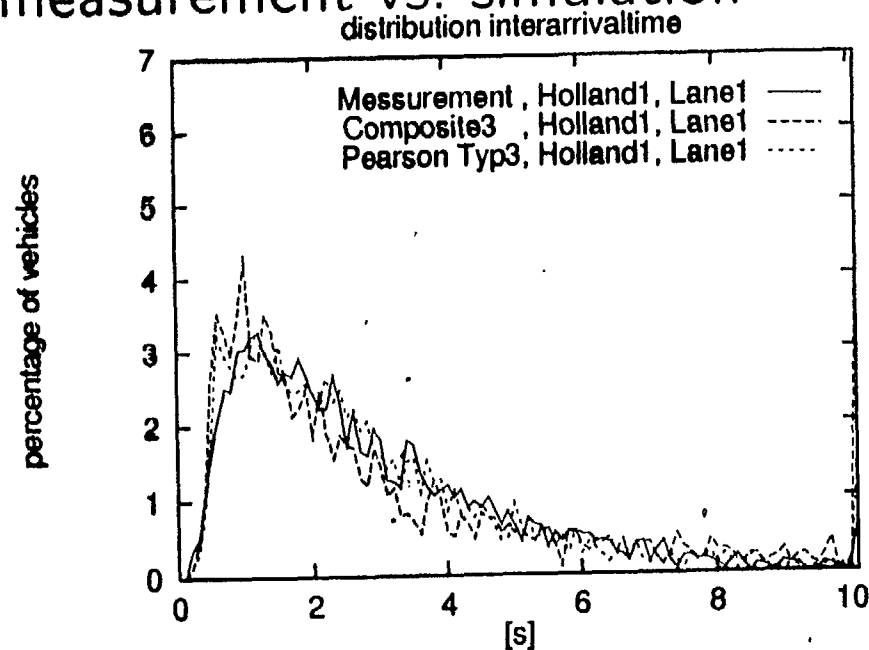
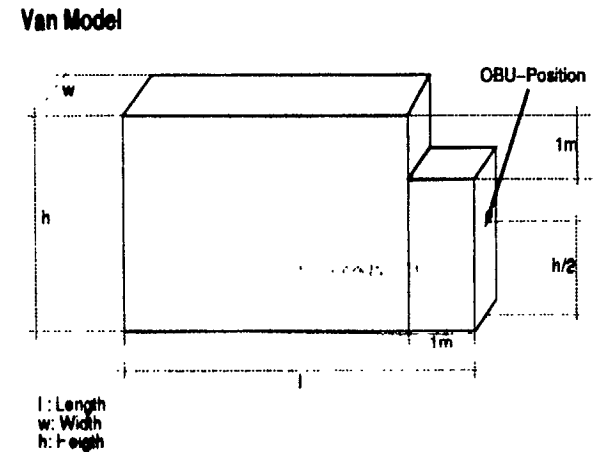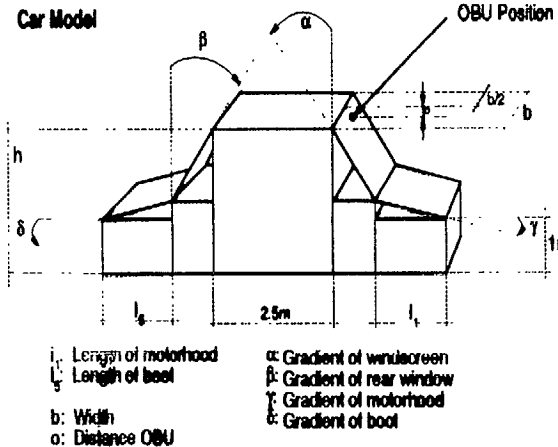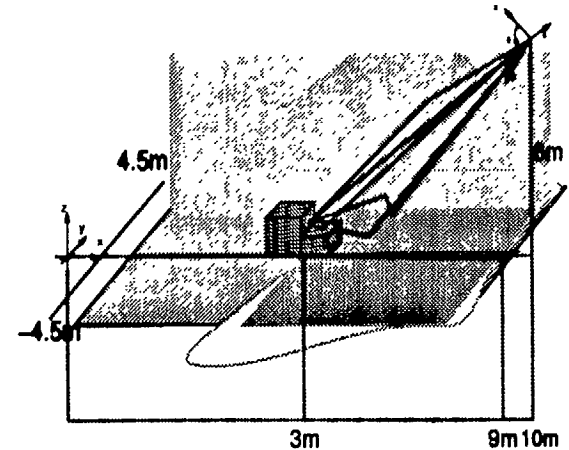# Propagation Modelling: Ray-tracing Techniques

SNR-Trace (Uplink)

freespace
car and road

SNRperBit

distance in meters

SNRperBit

30.67 dB

-9.67 dB

-50.00 dB

SNR-Trace (Uplink)

freespace
van and road

SNRperBit

distance in meters

SNRperBit

27.88 dB

-11.06 dB

-50.00 dB
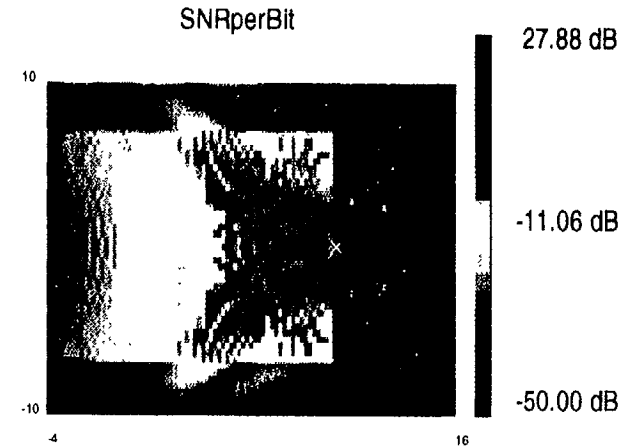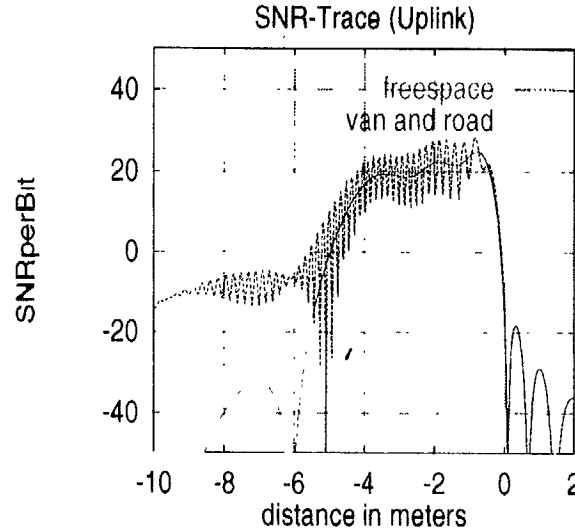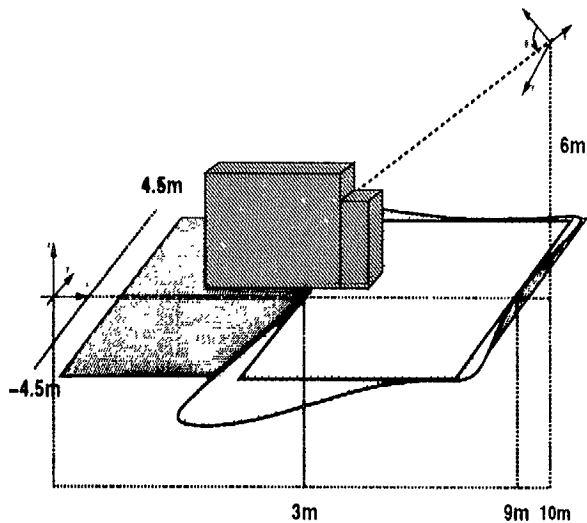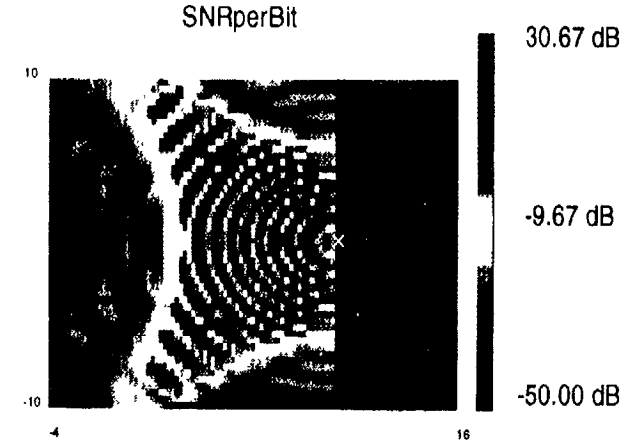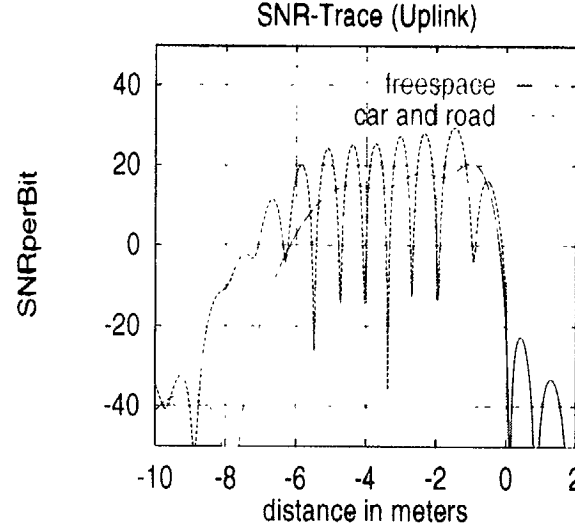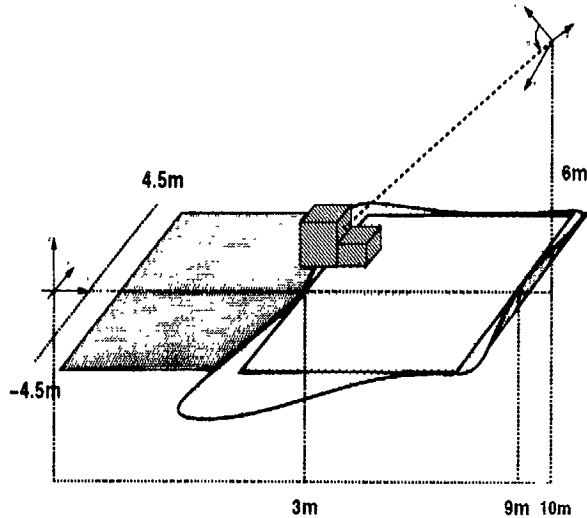
Examined Scenarios

Antenna Characteristics

Modelling of
'Shaped Beam'-Antennas

Beacon Antenna
(Array Antenna)

Driving Direction

Vehicle Models

Car Model

OBU Position

Van Model

OBU-Position

i_s: Length of motorhood
l_s: Length of boot

b: Width
o: Distance OBU

α: Gradient of windscreen
β: Gradient of rear window
γ: Gradient of motorhood
δ: Gradient of boot

l : Length
w: Width
h: Height

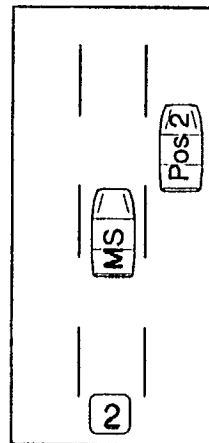## Traffic Situations
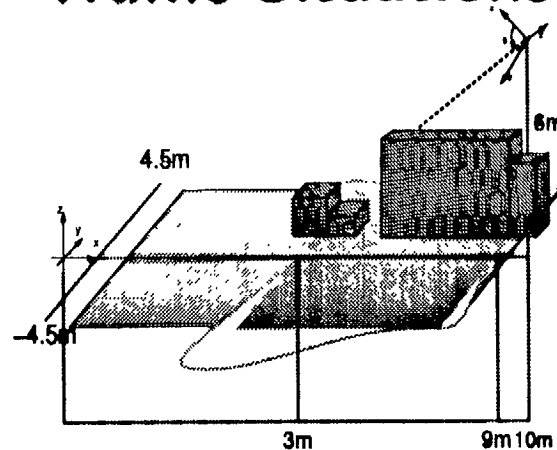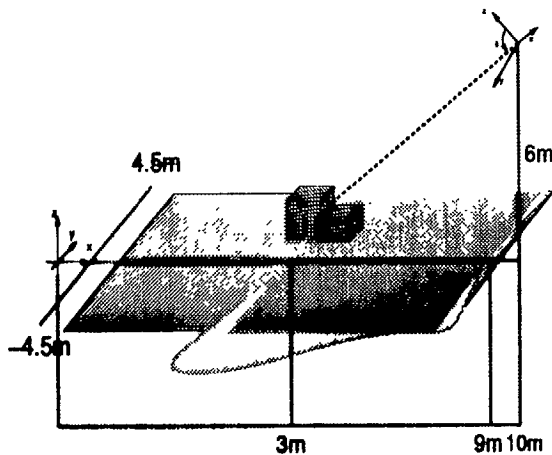
Relevant Traffic Situations

1	2	3	4	5
7∈.85 %	8.77 %	2.74 %	8.53 %	0.54 %
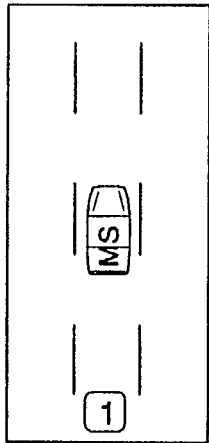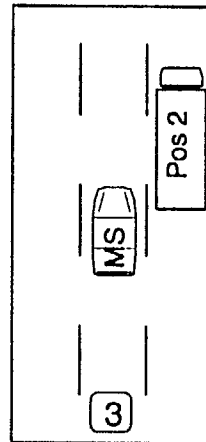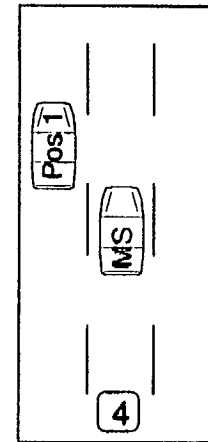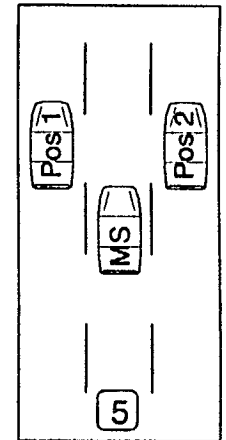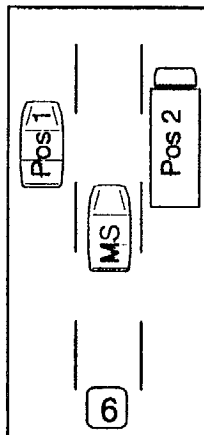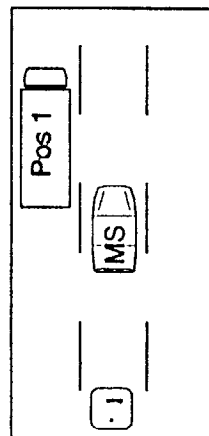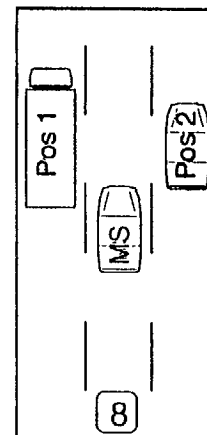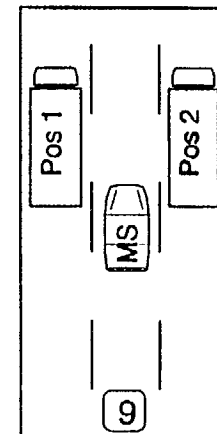
6	7	8	9
0.32 %	2.∪5 %	0.17 %	0.06 %

On-line calculation of shadowing effects
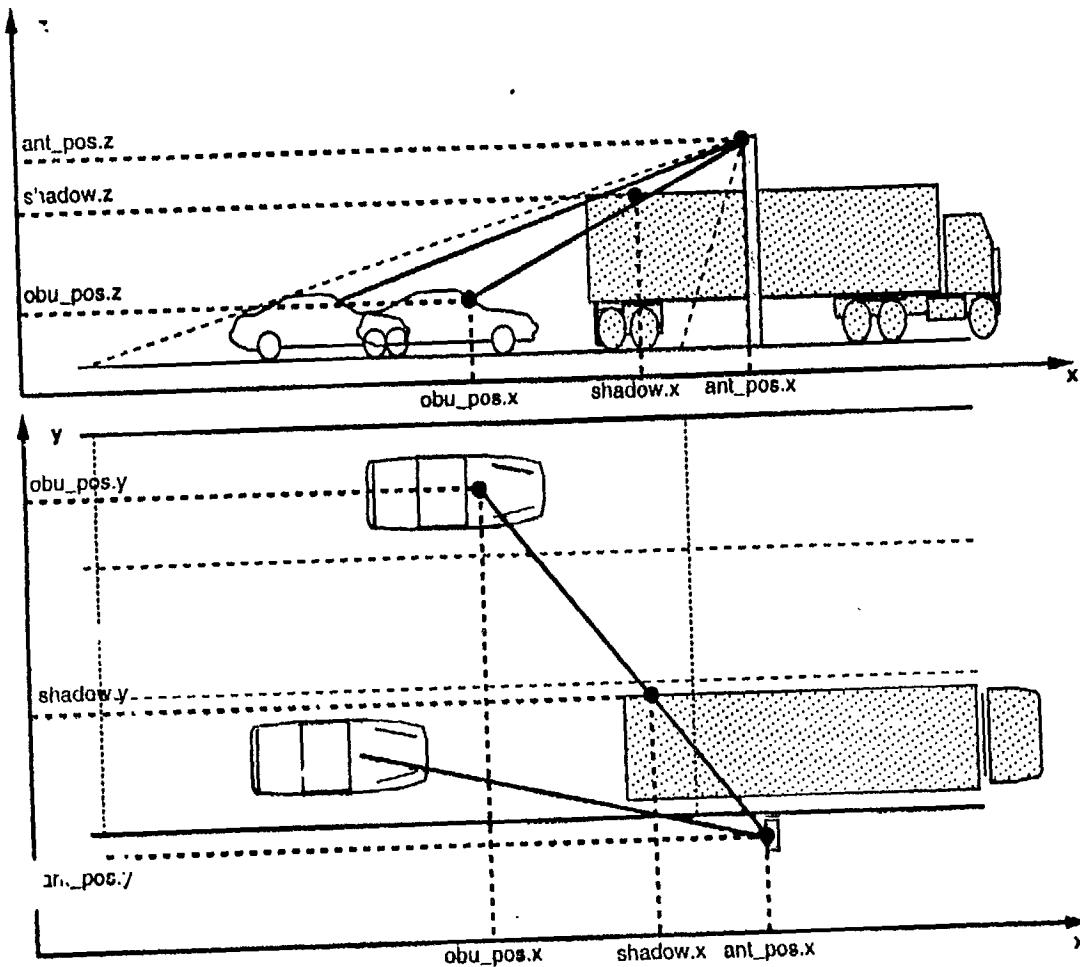
- Optimized Algorithm to identify shadowing situations implemented

Investigation of Signal Level
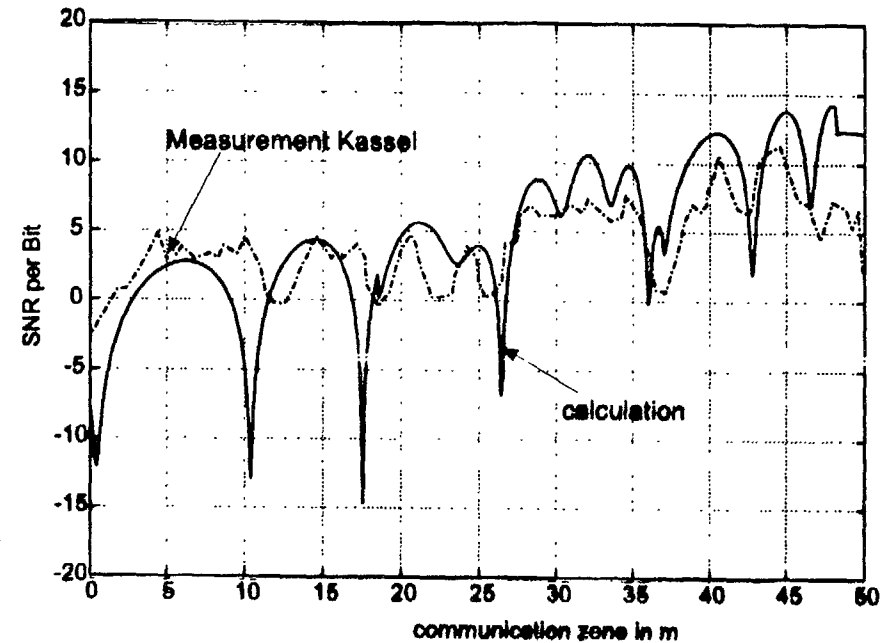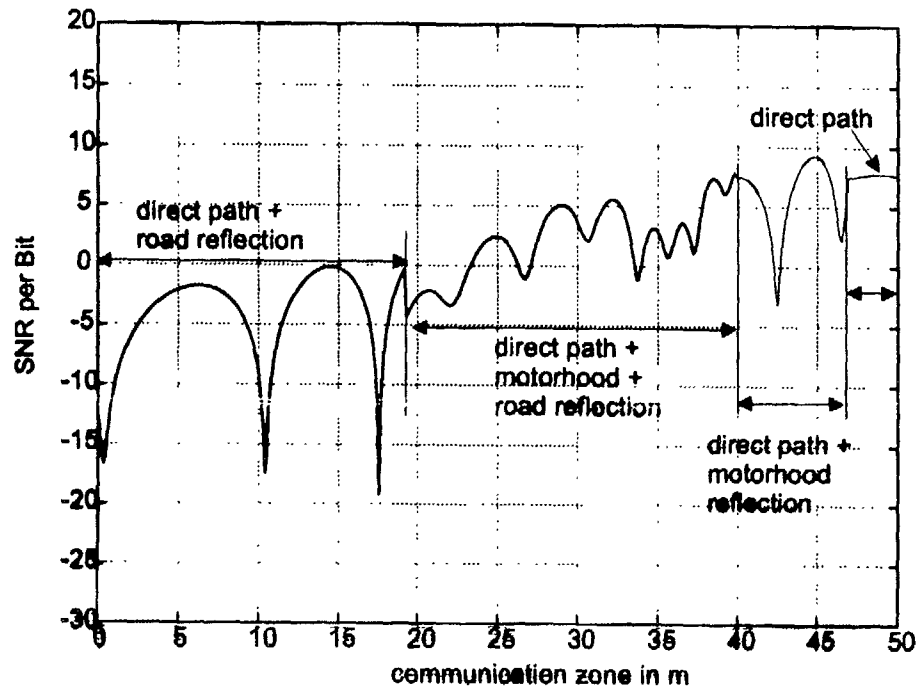
Impact of dominant Reflectors

- Motorhood causes strong fading with horizontal polarisation in near-field (metallic reflector)

- Improvement with circular polarisation (DSRC-Standard)

Comparison with measurement

- Measurement from University Kassel / Bosch Telecom

- Good correspondence of fading especially in the near-field

Transaction profiles
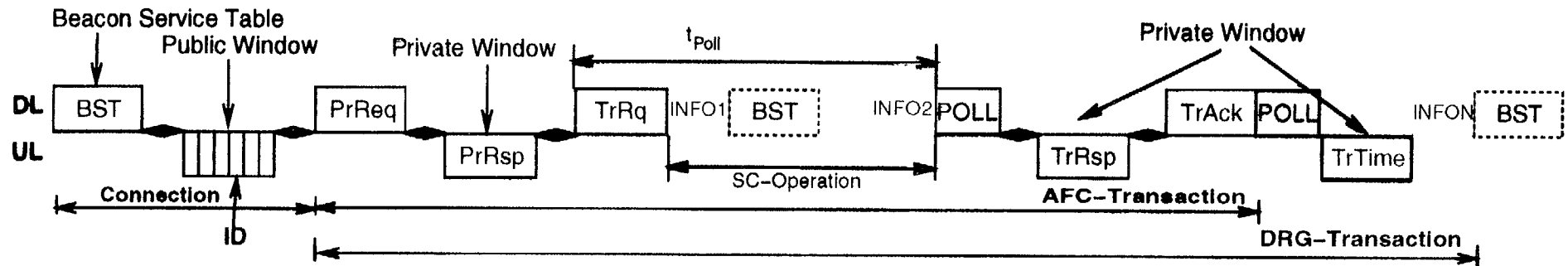
- interactive dialogue (Automatic Fee Collection AFC, data packets between 400 and 500 bit)

- broadcast-oriented service (Dynamic Route Guidance, broadcast INFO message (12 kbit, fragmented); Travel Time Report (300 bit)

- combination of both services according to Head-of-Line strategy with fixed priorities:
  AFC with high priority, DRG low priority

Analytical Protocol Evaluation

- Example: Address acquisition phase
  - multiple vehicles: collision reso-
    lution with random delay coun-
    ter or persistance mechanism
  - one vehicle: no collision, but de-
    lay due to collision resolution
    mechanism
  - trade-off needed

- Description of all possible state in
  terms of a Markov chain

- Performance criterium: time span
  used for address acquisition with gi-
  ven success probability.
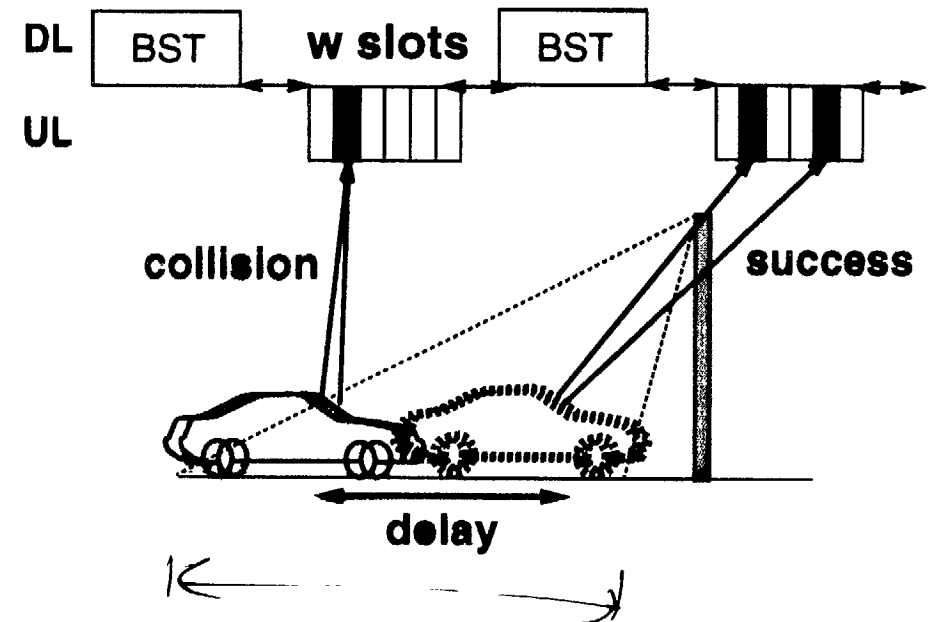
Analysed System Configurations:

Multiple Access techniques (SDMA vs. pure TDMA)

communication zone
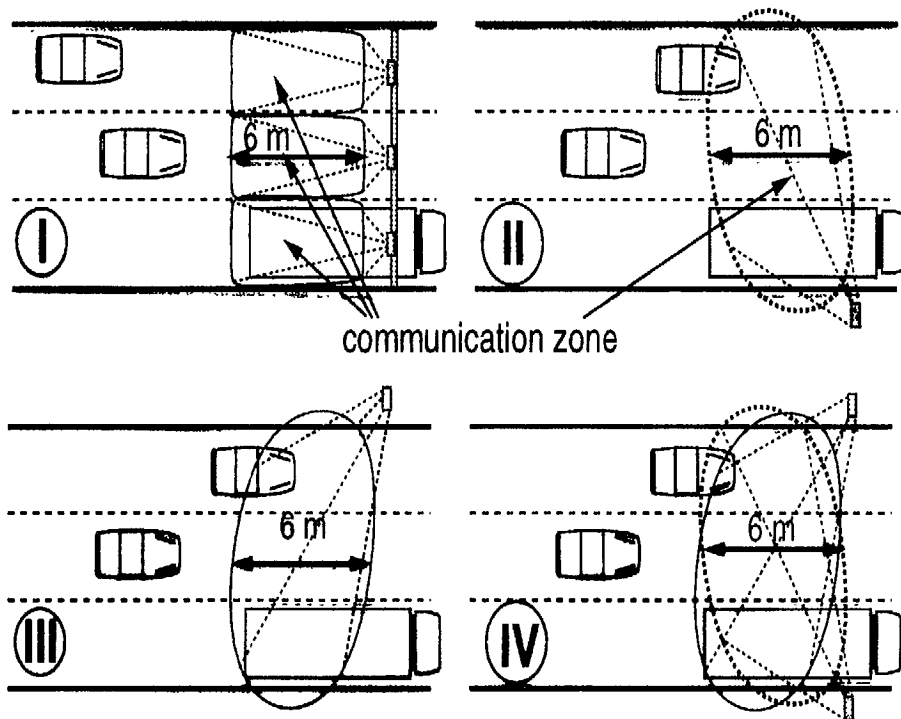
Config	I	II,III,IV
MA	SDMA	RTDMA
Down-link kbit/s	500	500
Up-link kbit/s	250	250
DL chan.	1	1
UL chan.	3	1
Pub Slots	2	6
Max. RDC	2	3

Results of Performance Analysis

Influence of Traffic characteristics

System Performance (A2/Netherlands and A9/Germany), single AFC
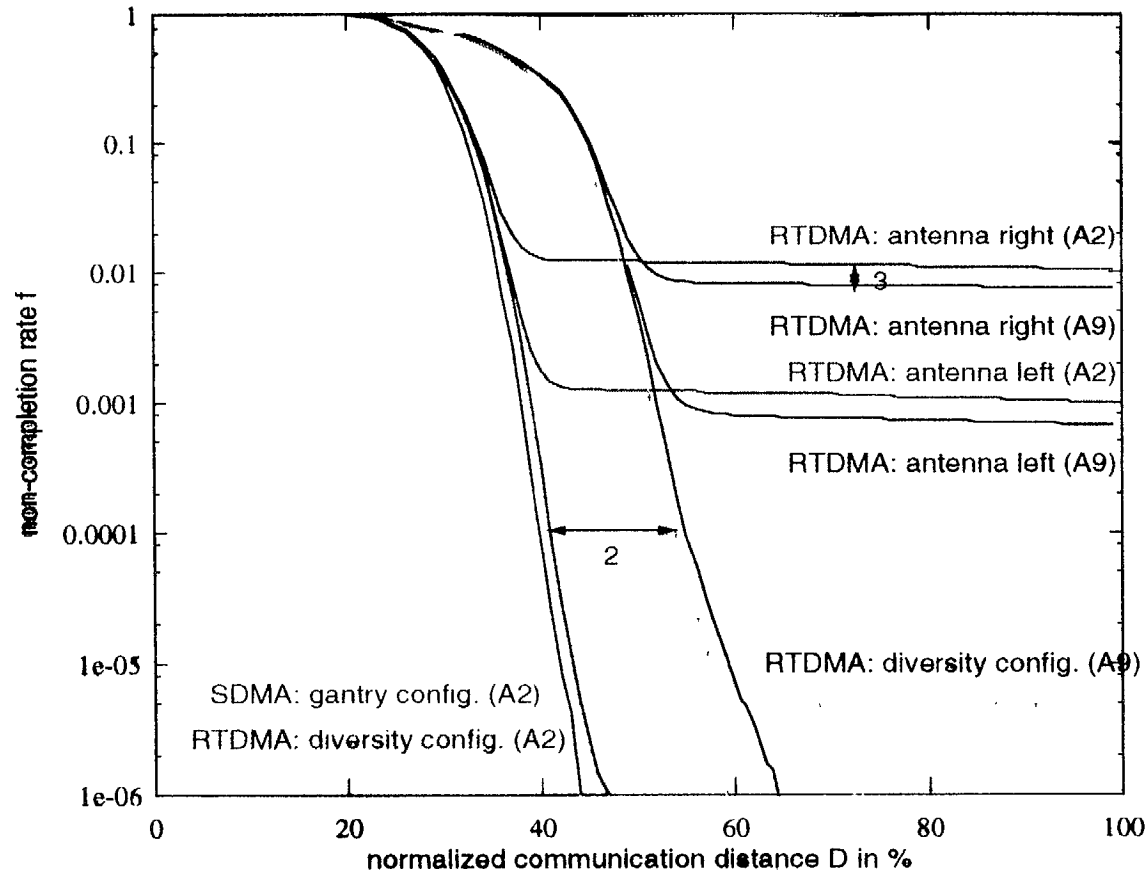
- influence of speeds (2): for SDMA configuration 59 % instead of 44 % max. used communications distance

- less intensity → less shadowing (3): lower intensity in A9 scenario leads to reduced impact of shadowing
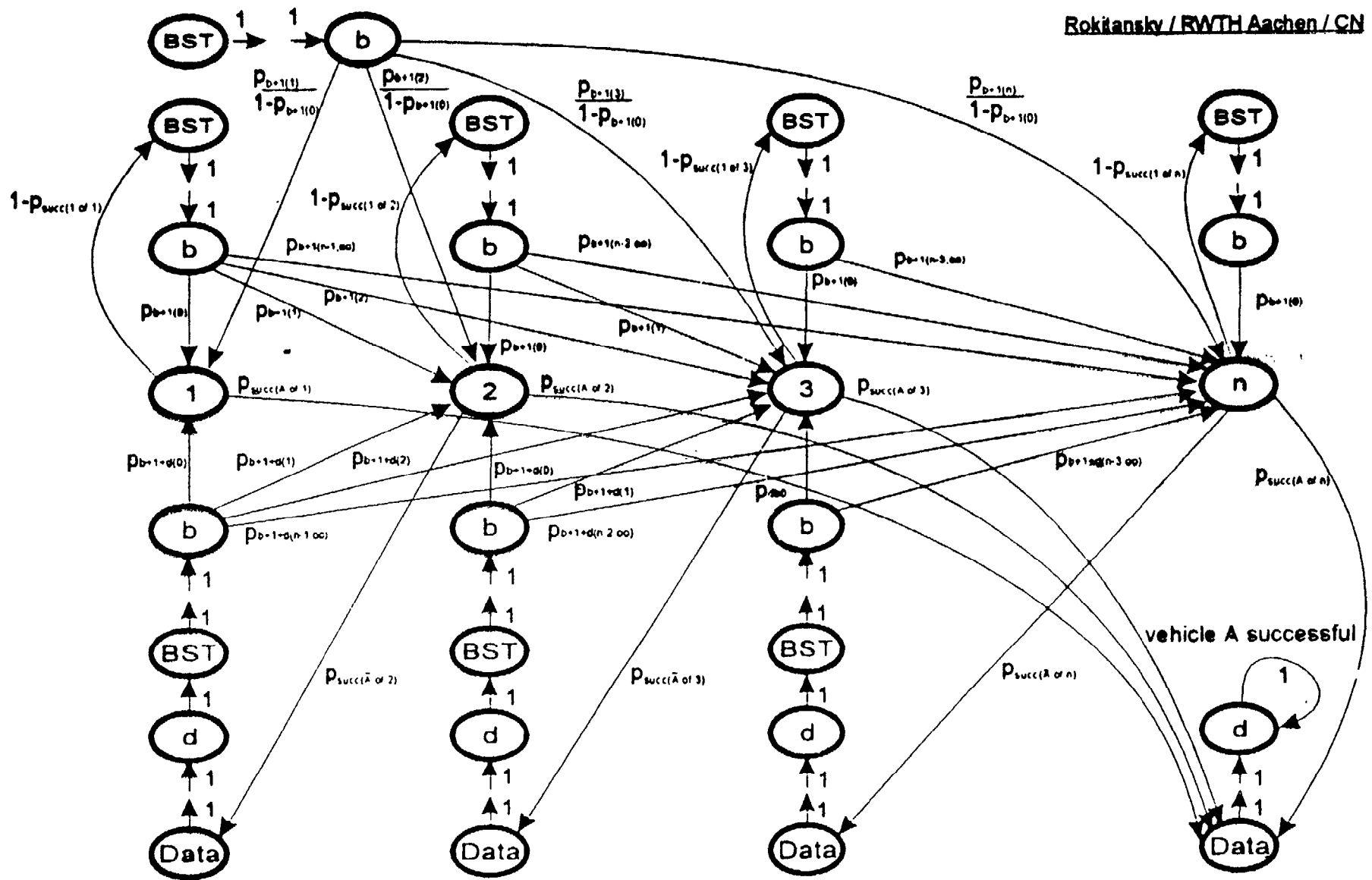
Figure 3: Markov Model of Dynamic Multi-level Transaction Completion Model for Single-Slot Persistence Mechanism

MARCO - Analysis of Persistence Mechanism - Single Slot

m40101	100	5m	500	125	1 1 4	n=3	p=0.1	1E-4	———
m40101	100	5m	500	125	1 1 4	n=3	p=0.2	1E-7	– – –
m40101	100	5m	500	125	1 1 4	n=3	p=0.3	53%	·······
m40101	100	5m	500	125	1 1 4	n=3	p=0.4	38%	········
m40101	100	5m	500	125	1 1 4	n=3	p=0.5	33%	–·–·–
m40101	100	5m	500	125	1 1 4	n=3	p=0.6	34%	–··–··
m40101	100	5m	500	125	1 1 4	n=3	p=0.7	47%	········
m40101	100	5m	500	125	1 1 4	n=3	p=0.8	91%	········
m40101	100	5m	500	125	1 1 4	n=3	p=0.9	4E-5	···:··:

Non-completion rate

Percentage of communication zone
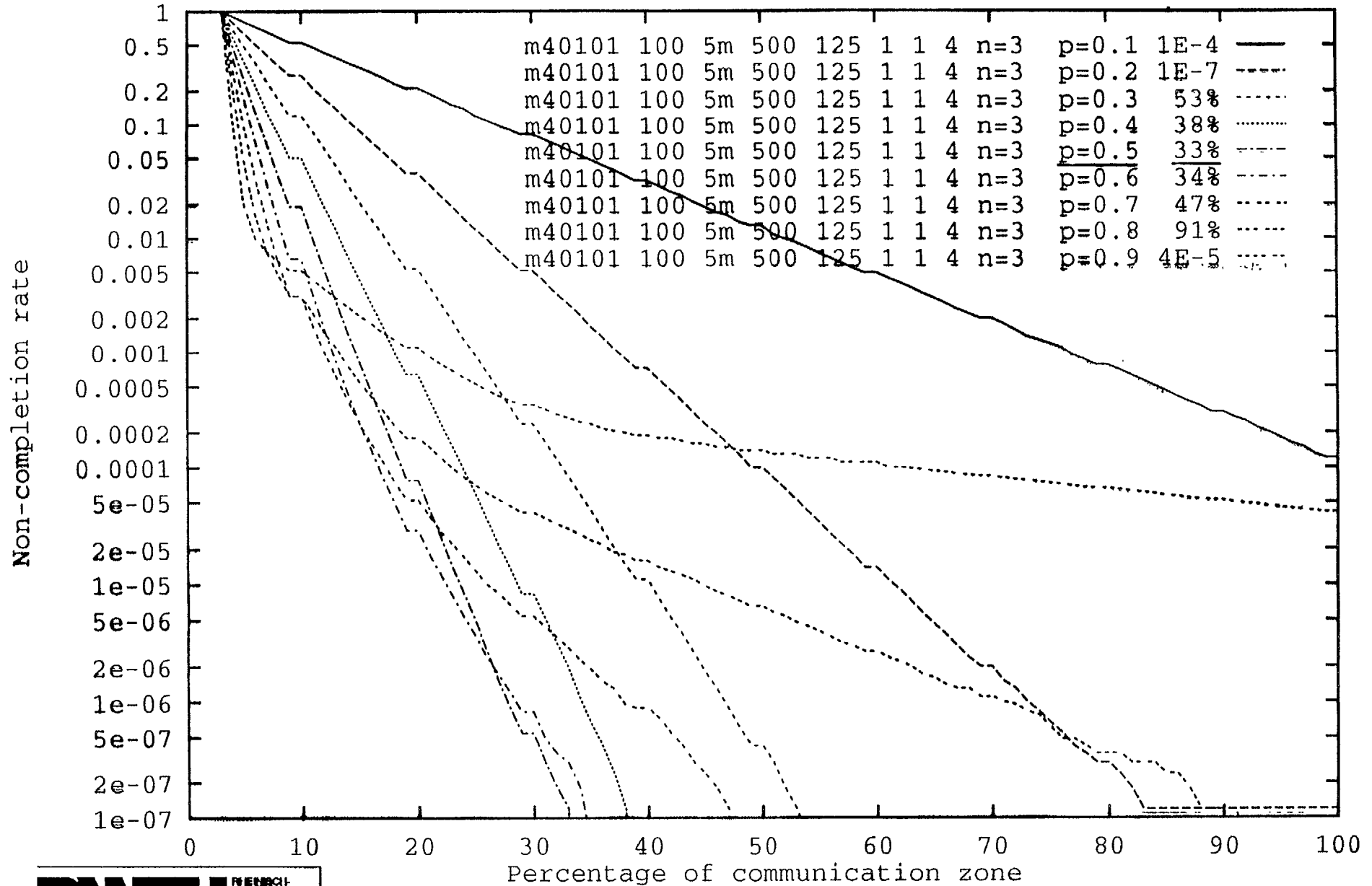
Samples: 100000 MPPSS veh/h: 7202 km/h: 100 Length (m): 5.0

s10	1	p 0.10	0.5	15.0%	9E-5	——
s10	1	p 0.20	0.4	9.4%	66.3%	----
s10	1	p 0.30	0.5	7.6%	51.1%	····
s10	1	p 0.40	0.6	6.6%	29.8%	········
s10	1	p 0.50	0.6	6.1%	24.8%	-·-·-
s10	1	p 0.60	0.6	5.7%	20.9%	-··-··
s10	1	p 0.70	0.8	5.4%	20.1%	-----
s10	1	p 0.80	1.1	5.2%	30.1%	-----
s10	1	p 0.90	3.0	5.1%	4E-5	······

Transaction NON-completion rate

Percentage of communication zone

RWTH RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN
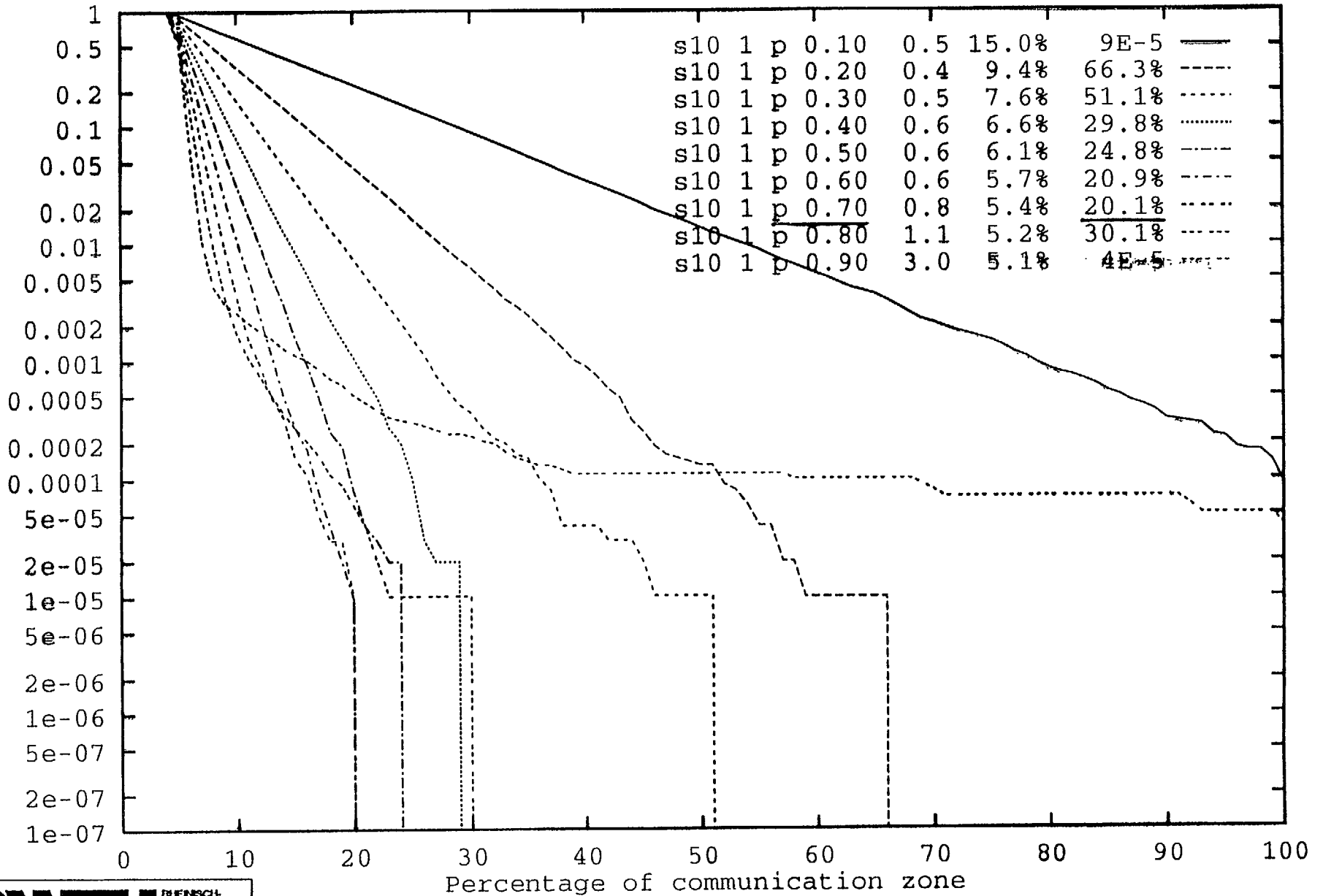
Conformance Test Approach

DSRC (CEN TC278 WG9)
Data Link Layer

DSRC (CEN TC278 WG9)
Application Layer

DSRC Implementation in SDL

DSRC Test Specification in TTCN

C Code Generator

C Code Generator

Executable Real Time Protocol

Conformance Test (ISO 9646)

Conformance Test Environment

DSRC conform protocol specification
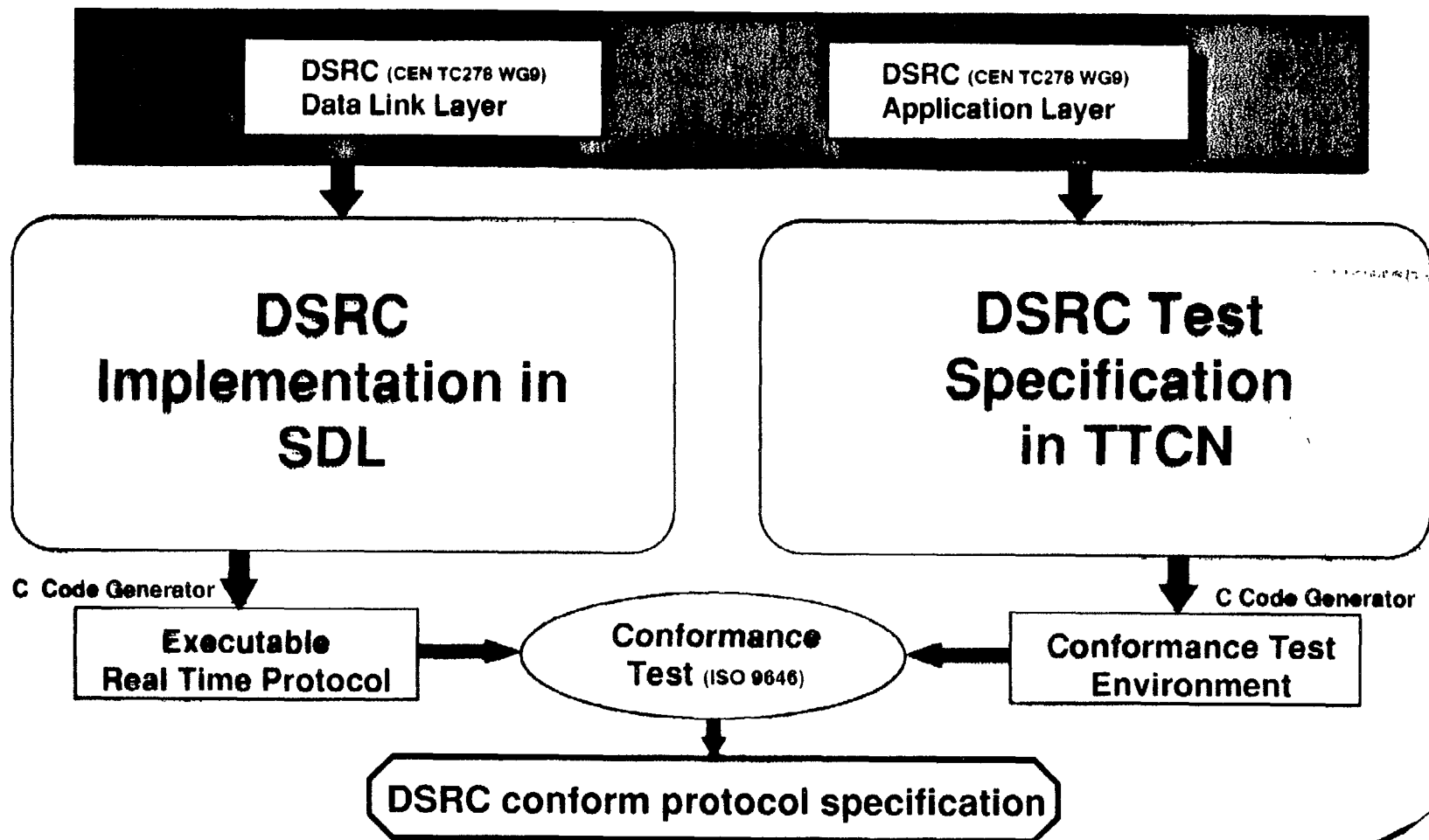
Conformance Tests using a Reference Beacon

Testgeneration Functionality

Realtime-Layer 2 Functionality

Simulation

TICN Test Suite   Ethernet

Application Layer

HDLC-Protocol

Data Link Layer   Reference Beacon Physical Layer

OBU 1
OBU 2   OBU 3
OBU 4

Implementation under test (IUT)
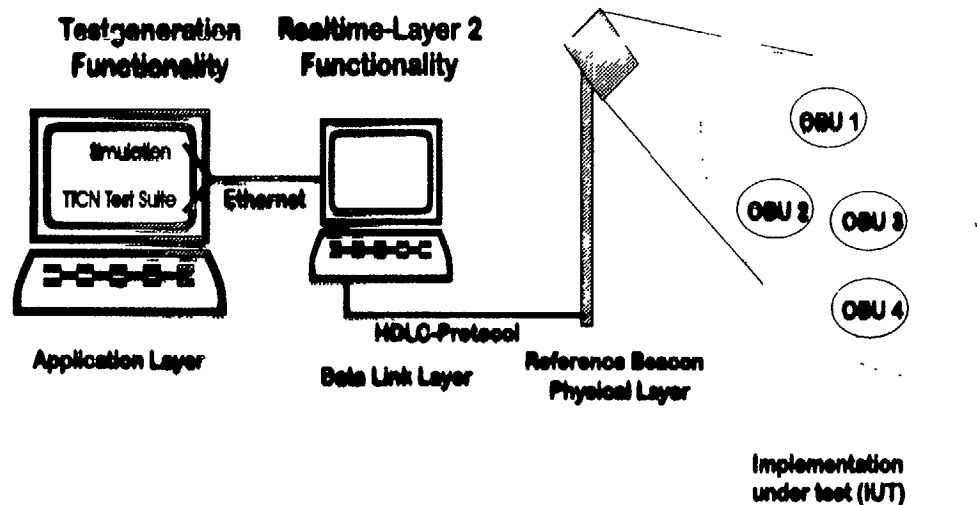
- Generation of a DSRC Test Suite

- Connection between Test Suite and Reference Beacon via Ethernet (ftp)

- Reference Beacon control via PC and HDLC protocol

- Evaluation of test results in the Test Suite

- optional: Simulation connection

Status of
CEN / TC 278 / WG9 "DSRC: Dedicated Short-Range Communications"

Carl-Herbert Rokitansky

Status of DSRC Standardisation:

#	IAbbreviated Title	Date	Status	%
ENV 12253	DSRC Physical Layer at 5.8 GHz	Aug.3,'97	**approved**	77
ENV 12795	DSRC Data Link Layer	June 13,'97	**approved**	85
ENV 12834	DSRC Application Layer	Sept.1,'97	**approved**	84
prENV IS0 15625	DSRC Profiles for RTTTApplicat.	Aug. 26,'97	ready stage 49	n.a.
prENV	DSRC Physical Layer Infrared	Sept. '97	ready stage 49	n.a.
ITR	Internal Report on Registration	Sept. 1997	ready distribut.	n.a.

Conclusions:
- **All three DSRC Layers (1,2,7) now approved as CEN ENV Standards**

Future main objectives of WG9:
- **Turn CEN / ENV's into CEN / EN Standards after 3 years (in year 2000)**
  - **International DSRC Standardisation (IS0 / TC 204 / WG15)**

Status of
IS0 / TC 204 / WG15 "DSRC: Dedicated Short-Range Communications"

Carl-Herbert Rokitansky

Status of international DSRC Standardisation:

Region	Europe	North America	Japan
Application Layer	**Towards adoption of an "Application Layer" (NP 15628) based on CEN**		
Data Link Layer (LLC)	**Towards adoption of LLC Sub-Layer of Data Link Layer (NP 15627) based on CEN**		
Data Link Layer (MAC)	Attempt for harmonisation of MAC Sub-Layer for 5.8 GHz		
Physical Layer 5.8GHz	CEN / ENV 12253	currently 915 MHz	Physical Layer 5.8GHz

Harmonisation Methodology agreed (efforts always towards highest level):

Level 3: Common Specification Elements
Level 2: Common Specification Elements with variance (Communication Profiles)
Level I: Parallel Specification Elements (if necessary and no conflicts / interference)

Conclusions:

● **Convergence of international DSRC Standardisation is obvious !**

ISO / TC 204 / WG15 Subgroups have been set up recently:

ISub-group	Title	Convenor	from Region
WG15 / SG.L7	Sub-group "Application Layer"	S. Bueno	Europe
WG15 / SG.L2	Sub-group "Data Link Layer"	L. Armstrong	North America
WG15 / SG.L1	Sub-group "Physical Layer"	M. Sato	Japan
WG15 /Arch.	Sub-group "DSRC Architecture"	A. Hjelmare	Europe

Conclusions:

- **Strong international participation**
- **3 regions contribute significally: Europe, Japan, North America**
- **4 joint WG9 / WG15 Meetings in 1997:**
    - **January 27-28: Madrid, Spain**
    - **April 23 - 24:   Paris/Bretigny, France**
    - **Sept. 8 - 9:   Salzburg, Austria**
    - **Oct. 13 - 15:   Berlin, Germany**
- **Joint WG9 / WG15 Meeting planned for 1998:**
    - **Jan. 28 - 30:   Europe**
    - **Apr. 27 - 29:   Toronto, Canada**
    - **Oct. 5 - 7:   Seoul, Korea**

Conclusions (1):

- **DSRC <u>Physical Layer</u> using 5.8 GHz; DSRC <u>Data Link Layer</u>, and DSRC <u>Application Layer</u> have been <u>approved as European CEN ENV Standards</u>**

- **CEN DSRC ENV Standards are suitable for <u>multi-lane</u> and <u>multi-application</u>**

- **CEN DSRC ENV Standards are already going to be <u>approved as DSRC Standards</u> even <u>outside Europe</u> (e.g. Australia)**

- **CEN DSRC ENV Standards are being considered in various countries by <u>national standardisation</u> groups and research institutes:**
  - **South-East Asia (Korea, Malaysia, Taiwan, etc. ?)**
  - **South America (Argentina, Brazil, Chile, etc. ?)**

Conclusions (2):

- **In the mid- / long-term future full-duplex / transceiver based DSRC systems at data rates beyond 10 Mbit/s are expected to be developed.**

- **Half-Duplex / Transponder based 5.8 GHz DSRC Systems based on ISO/ CEN DSRC ENV Standards is the technology of today and tomorrow**

- **Motorway Operators and Road Authorities require the installation and operation of <u>interoperable Electronic-Fee-Collection (EFC)</u> Systems and other Telematics applications based on <u>stable ISO/CEN DSRC Standards now</u>**

- **Intensive field trials of DSRC systems are currently carried out in the following European countries (non-exhaustive list): Austria, France, Germany (A555 Cologne - Bonn), Norway (E6 Trondheim), Portugal (Lisbon), United Kingdom**

Conclusions (3):

It is expected that Dedicated Short-Range Communication Systems based on the <u>CEN DSRC ENV Standards</u> to support New Services for Telematics in Mobility will become <u>operational</u> in the near future in the following European countries (non-exhaustive list):

- **Austria**
- **Denmark**
- **France**
- **ITALY (?)**
- **Netherlands**
- **Portugal (migration to DSRC ENV from existing Low Data Rate System)**
- **Switzerland**
- **United Kingdom**

Conclusions (4)

- **The following <u>ISO DSRC Drafts</u> have already been sent out for comments (deadline Feb 17,1997):**
    - **NP 15626 (ENV 12252): Physical Layer using Microwave at 5.8 GHz**
    - **NP 15627 (ENV 12795): Data Link Layer: Medium Access and Logical Link Control**
    - **NP 15628 (ENV 12834): Application Layer**
    - **Draft prENV IS0 15625: DSRC Profiles for RTTT Applications**

- **IS0 DSRC Standards based on CEN: <u>Application Layer</u> (NP 15628) and <u>Logical Link Control</u> LLC Sublayer of <u>Data Link Layer</u> (NP 15627) are expected to be adopted also in North <u>America and Japan</u>; Physical Layer Standard Specifications will be different due to different regional requirements and constraints**

TOGETHER we will be able to achieve further appropriate solutions for ITS / DSRC Standardisation and Interoperabilty for the benefit of RTTT users !

Contacts:

1) Dr. Carl-Herbert Rokitansky   **Tel.: +49-241-88 903-24**
                                                           +49-172-241 04 71 (GSM)

 RWTH Aachen University of Technology   Fax: +49-241-8888-242
 Communication Networks   **+49-172-241 05 25 (GSM-Fax)**
 Kopemikusstr. 16
 D-52074 Aachen, Germany   **Email: roki@comnets.twth-aachen.de**

 concerning:
- **DSRC Standardisation (International and European)**
- **CEN / TC 278 / WG9 "DSRC: Dedicated Short-Range Communications" (Europe)**
- **IS0 / TC 204 / WG15 "DSRC: Dedicated Short-Range Communications" (International)**
- **VASCO: "Validation of DSRC" (European Telematics Applications Project EC/TR 1062)**
- **AI: "Interoperability of European Electronic Fee Collection (EFC) Systems"**
  (Upcoming European Telematics Applications Project; follow-up of VASCO)

2) MCO Mobile Communications Research & Development GmbH (A-5026 Salzburg, Gansbrunnstr. 3, Austria)

 Mr. August Segur-Cabanac   **Tel.: +43-662-43 31 18**
                                                            Fax: +43-662-63 05 92
 or Dr. Carl-Herbert Rokitansky (see above) as DSRC Research Adviser

 concerning (in co-operation with RWTH Aachen / ComNets):
- **DSRC System Performance Evaluation by Simulation and Analysis**
- **DSRC Standard Compliance Testing**
- **DSRC Development Guidance**
- **DSRC Training & Seminars**

Paper 122

Processes for Implementing Standards – Japan

Sam Oyama

Process for Developing DSRC Standards in Japan

December 17, 1997

Radio Communications Group
ISO/TC204/WG15
Committee of Japan

Sam @ Oyama

- World trend of DSRC standardization
- DSRC standardization in Japan.
    - Studying organization
    - Studying progress
- Outline of DSRC standards.
    - CEN vs U.S. vs Japan
    - Japanese standards
    - International harmonization

DSRC standardization - Europe

- Organization :

  < CEN(TC278/WG9), ETSI, ERC >

- 1992 : Initiated

  4 Drafts : L1(5.8GHz), L2, L7+ *L1(Infrared)*

- 1996 : Proposed to IS0 and agreed as NP

- 1997 (Sept) : Approved

  < L1(5.8GHz), L2, L7 >

DSRC standardization - U.S.

- Organization :

  < ITS America, ASTM/IEEE, FCC >

- 1996 : Initiated

  3 Drafts : L1(91 5MHz), L2, L7

- 1998 : Scheduled for the voting

- 19?? : Ll(5.8GHz) will be approved

DSRC standardization - Japan

- Organization :

   *ETC P.C:

      Electronic Toll Collection Promotion Committee

   *ISO/TC204/WG15-Japan

   *MPT:

      Ministry of Posts and Telecommunications

   *ARIB:

      Association of Radio Industries and Businesses

DSRC standardization - Japan

- 1995 : Initiated

    3 Drafts : L1(5.8GHz), L2, L7

- 1997 (Mar.) : TTC*recommendations

- 1997 (Apr.) : Submitted to IS0

- 1997 (Sep.) : Radio Law revision

- 1997 (Nov.): ARIB approved

TTC:Telecommunications Technical Council

Organization : Japanese DSRC standards

<MITI>

<MOC>

-ETC Joint Research Team

Other WGs ISO/TC204

ISO/TC204 National Committee of Japan

Ministries & Agency

<MPT>

ETC Promotion Committee

ISO/TC204/WG15

Committee of Japan

(Radio com.group)

- Committee for Wireless Card
- TTC
- RRC

ARIB

ISO
Int'l meeting

ITU-R
Int'l meeting

ISO/TC204/WG15/Radio Comm G, Committee of Japan
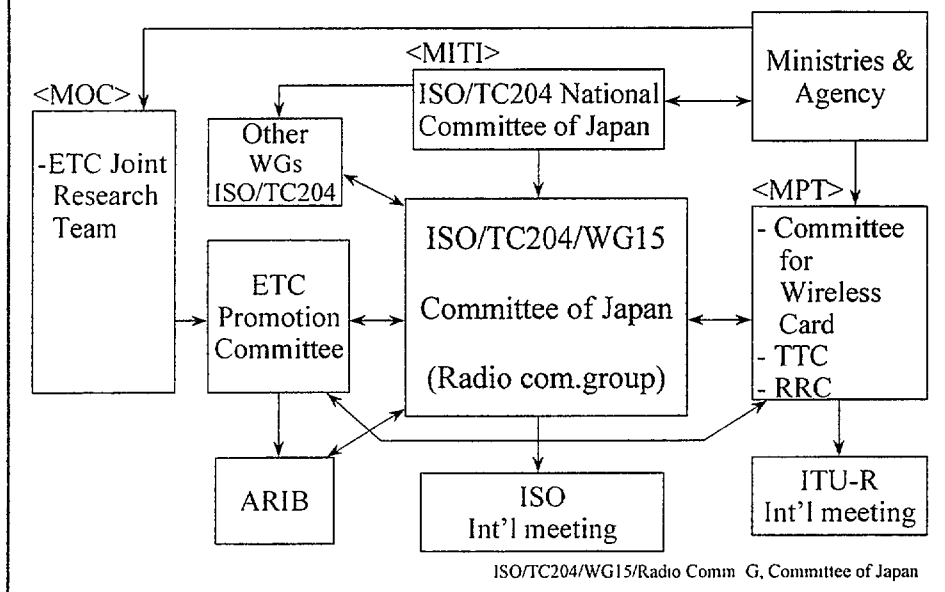
ISO/TC204/WG15 Committee of Japan

| ISO/TC204/WG15 Committee of Japan | (Secretariat : EIAJ)
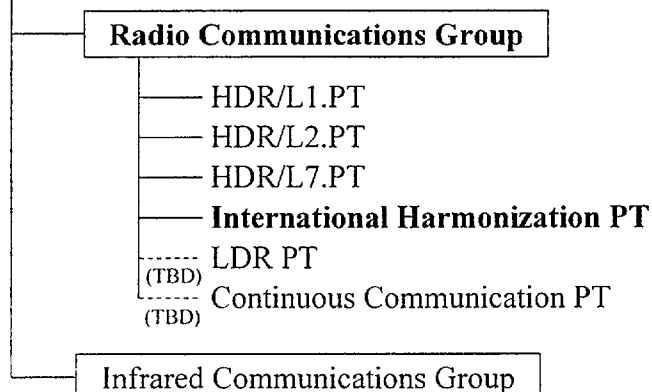
Radio Communications Group

- HDR/L1.PT
- HDR/L2.PT
- HDR/L7.PT
- **International Harmonization PT**
- LDR PT (TBD)
- Continuous Communication PT (TBD)

Infrared Communications Group

ISO/TC204/WG15/Radio Comm G, Committee of Japan

ISO/TC204/WG15 Committee of Japan

- Project Team Member (Radio Comm. G.) <1>
  - JAPAN HIGHWAYS(JH)
  - METROPOLITAN HIGHWAYS
  - HANSHIN EXPRESSWAY
  - HGHWAY INDUSTRIES DEVELOPMENT ORGANIZATION(HIDO)
  - VEHICLE INFORMATION AND COMMUNICATIONS SYSTEM CENTER(VICS)
  - HIGHWAY TELECOM ENGINEER

ISO/TC204/WG15/Radio Comm G, Committee of Japan

ISO/TC204/WG15 Committee of Japan

- Project Team Member (Radio Comm. G.) <2>
  - DENSO
  - HITACHI
  - HITACHI CABLE
  - MATSUSHITA COMMUNICATIONS
  - MITSUBISHI ELECTRIC
  - MITSUBISHI HEAVY INDUSTRIES
  - NEC
  - NISSAN
  - OKI ELECTRIC
  - SUMITOMO ELECTRIC
  - TOSHIBA
  - TOYOTA

ISO/TC204/WG15/Radio Comm G, Committee of Japan

Background : Japanese Standards

- Requirements:
    - More information(High speed transmissions)
    - Frequency band efficeincy(5.8GHz)
    - High reliability
    - Supporting many ITS applications
        - *ETC:Non-stop, Non-contact, Free flow(future)
        — *Difficulties in applying CEN drafts*
- WTO : Japanese standards — IS0 standards

Progress : Japanese DSRC standardization -1

1) Radio standardization for ETC
    - Nov. 1994 : MPT started deliberations
    - Committee for Wireless Card :
        MPT, MOC, Universities, Vendors and etc.
2) ETC Joint Research Program
    - June 1995 - March 1996
        *Conducted by MOC, 4 major road
            administrators and ETC P.C.
        *Goal : Requirements for DSRC

Progress : Japanese DSRC standardization -2

3) Basic Concept
- Preparation : ETC P.C.
- Proposed to :
- The Committee of Wireless Card
- ISO/TC204/WG15 Committee of Japan
- Telecommunications Technology Council

Progress : Japanese DSRC standardization -3

4) Development of DSRC draft standards
- ISO/TC204/WG15 Committee of Japan.
  organized studying groups & Project Teams.
- 3 PTs of Radio corn. group has started writing
  draft standards.
- April 1997, submitted draft standards to
  ISO/TC204/WG 15 meeting in Paris.

Progress : Japanese DSRC standardization -4

5) Domestic establishment

   - Mar. 1997 : TTC issued formal report on

      ETC/DSCR basic concepts.

   - Sept. 1997 : RRC revised radio laws.

   - Nov. 1997 : ARIB approved DSRC standards.

DSRC regional standards

Item	Europe(CEN)	U.S.	Japan
Frequency band	5.8 GHz	915 MHz (5.8 GHz in the future)	5.8 GHz
Communication systems	Transponder	Dual mode (Active & Backscatter)	Transceiver (Active)
Data transmission rate	Downlink:500Kbps Uplink :250Kbps	Downlink:500Kbps Uplink :500Kbps	Downlink:1,024Kbps Uplink :1,024Kbps
Outline of protocol	Non-synchronous	Synchronous & Asynchronous	Synchronous
Duplexity	Half-duplex	Half-duplex, Full-duplex (under study)	Half-duplex Full-duplex (RSE)

CHANNEL ALLOCATION in JAPAN

5.8GHz Band , 60MHz

Downlink

D1 D2

5,790   5,850   FREQ.

5,795 | 5,805 | 5,815 5,825 | 5,835 | 5,845

U1 U2

Uplink   10MHz

40MHz   10MHz

channelp.doc
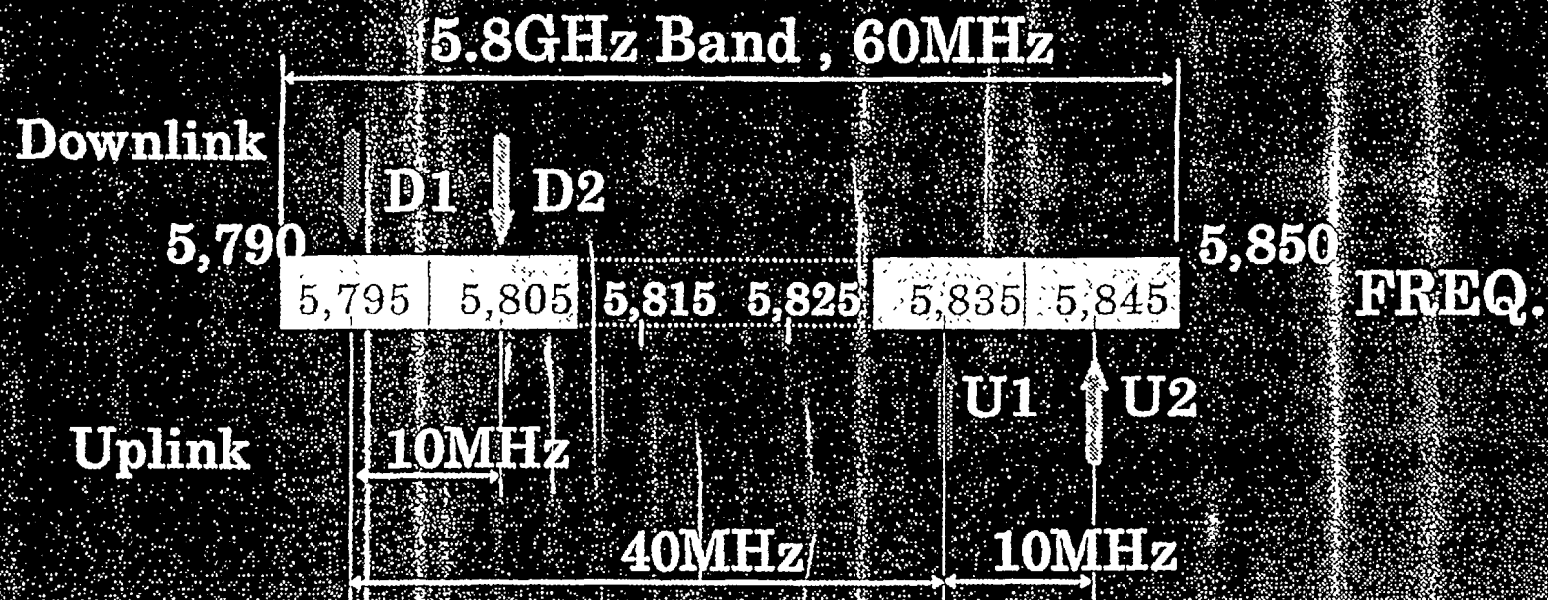
Frequency Allocation for ITS

Freq.(MHz)	5,800	5,900

Frequency Allocation (ITU-R)	5,725 ISM Band 5,875

EUROPE (ERC/CEPT)	5,795 5,815

U.S.A. (FCC)	902 928 5,850 in petition 5,925

JAPAN (MPT)	5,790-5,810 5,830-5,850 Down Link Up Link

CHANNEL ALLOCATION

HDR 1Mbps/1Mbps	}	Japan
HDR 1Mbps/250kbps	}	
MDR 500kbps/250kbps	}	Europe
LDR 62.5kbps/31.25kbps	}	

Frequency (MHz)

5,790 5,795 5,800 5,805 5,810 5,815
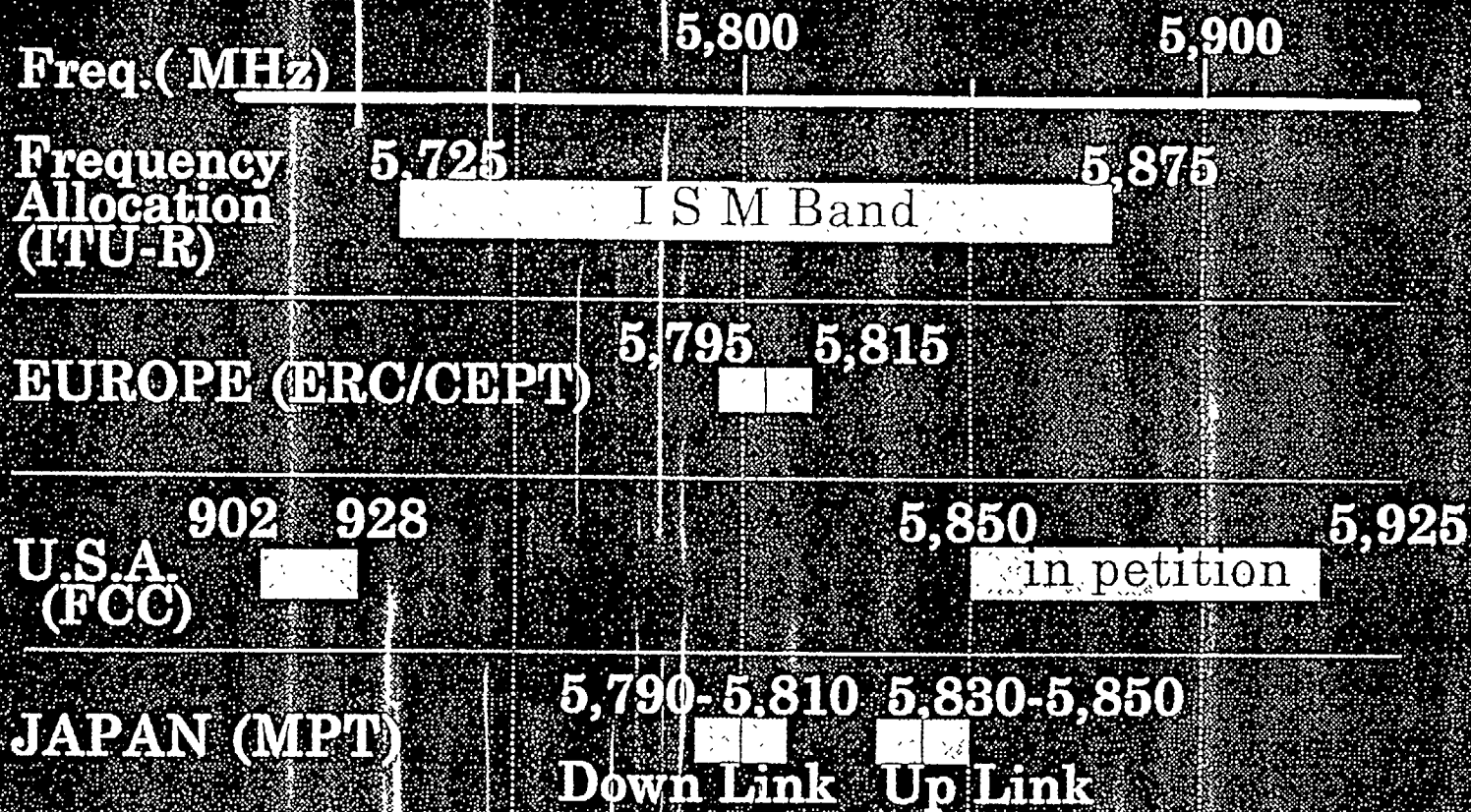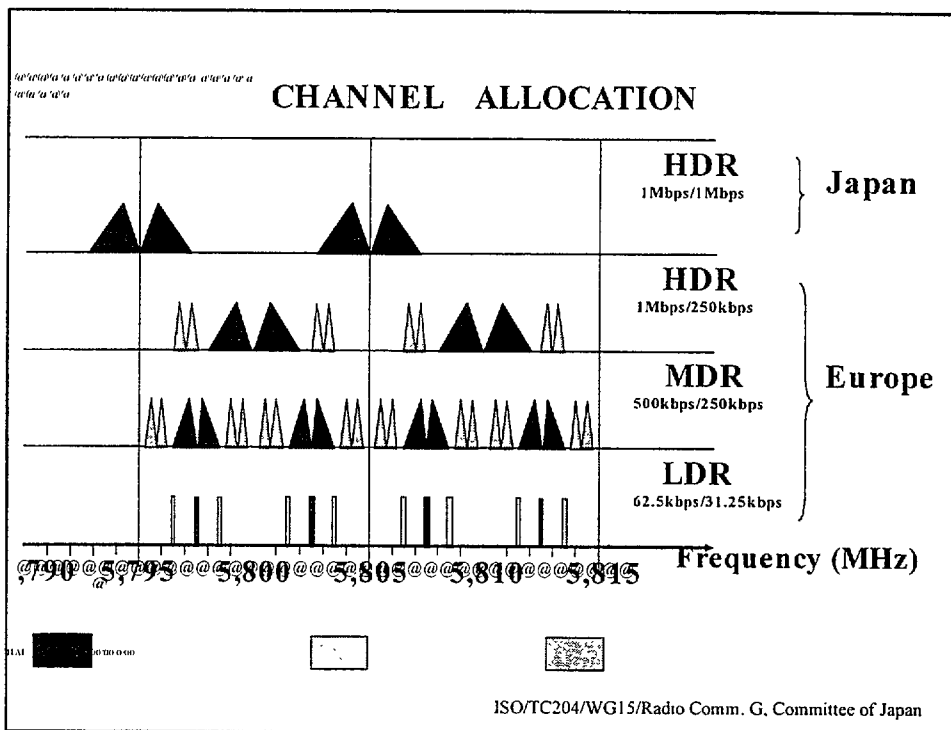
Outline : Japanese DSRC/L1

Item	Standard value
Frequency band	5.8GHz(ISM band)
Communication systems	Active transceiver (RSE:full-duplex, OBE:half-duplex)
Modulation	ASK
Encoding	Manchester
Bit rate	1,024Kbps
Occupied frequency band	8MHz max./channel
Carrier frequency interval	10MHz
Transmit/receive frequency interval	40MHz
Transmission power	RSE:300mW max.(distance > 10m) 10mW max.(distance ... 10m) OBE: 10mW max.
Antenna gain	RSE:20dBi max., OBE:10dBi max.

Outline : Japanese DSRC/L2

Frame=(FCMS(1)+4slots)=5 ×100=500[octets]

RSE ← 1 Slot →

Down Link | FCMS | MDS (OBE-A) | MDS (OBE-B) | MDS (OBE-C) | MDS (OBE-D)

Up Link | MDS (OBE-C) | MDS (OBE-D) | MDS (OBE-A) |

MDS (OBE-A) : FCM receipt | Data receipt | Data trasmit — ACTC

MDS (OBE-B) : FCM receipt | Data receipt — ACK/NACK

MDS (OBE-C) : FCM receipt | Data trasmit | Data receipt — MDC

MDS (OBE-D) : FCM receipt | Data trasmit | Data receipt

MDS (OBE-E) : FCM receipt

ISO/TC204/WG15/Radio Comm. G. Committee of Japan
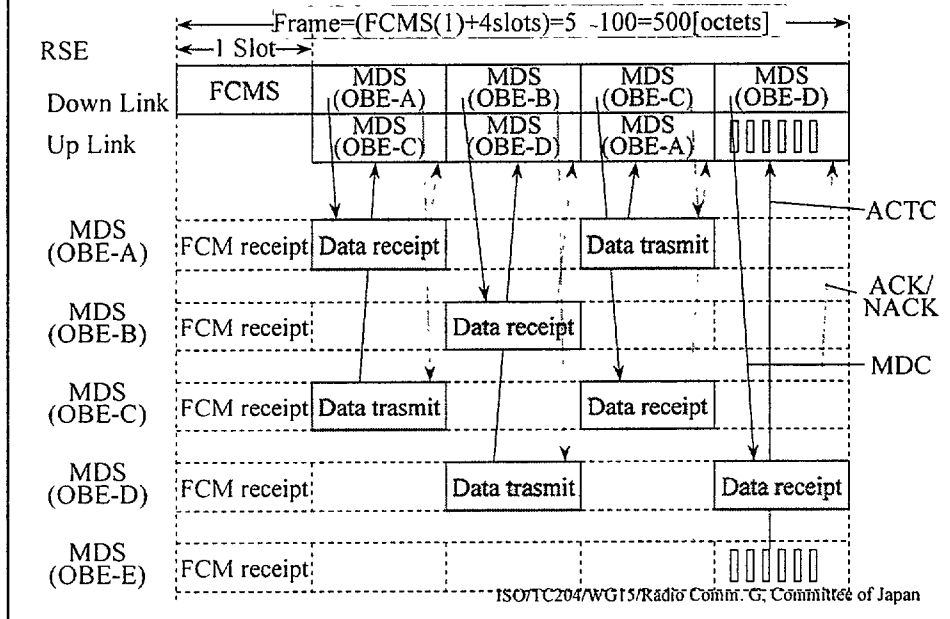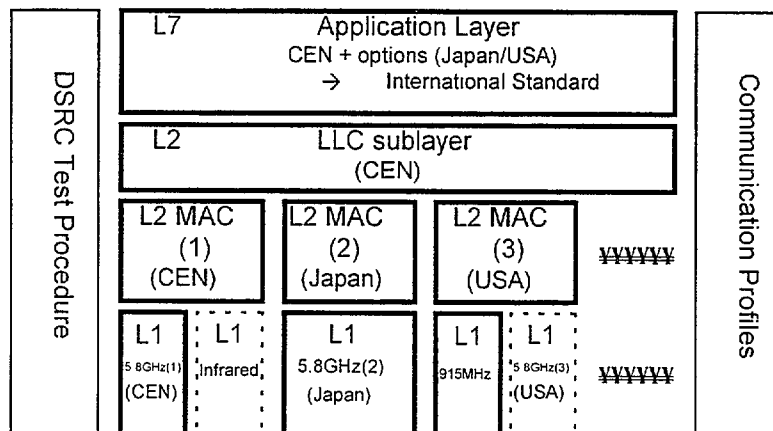

Outline : Japanese DSRC/L7

- Close to CEN (& U.S.)
  → International Standards
- Requirements of minor changes
  - Modification for initial connection
  - Addition of Fragment Length (FL)
  - etc.

1

For international harmonization

	L7 Application Layer CEN + options (Japan/USA) → International Standard	
DSRC Test Procedure	**L2** LLC sublayer (CEN)	**Communication Profiles**

L2 MAC (1) (CEN)   L2 MAC (2) (Japan)   L2 MAC (3) (USA)

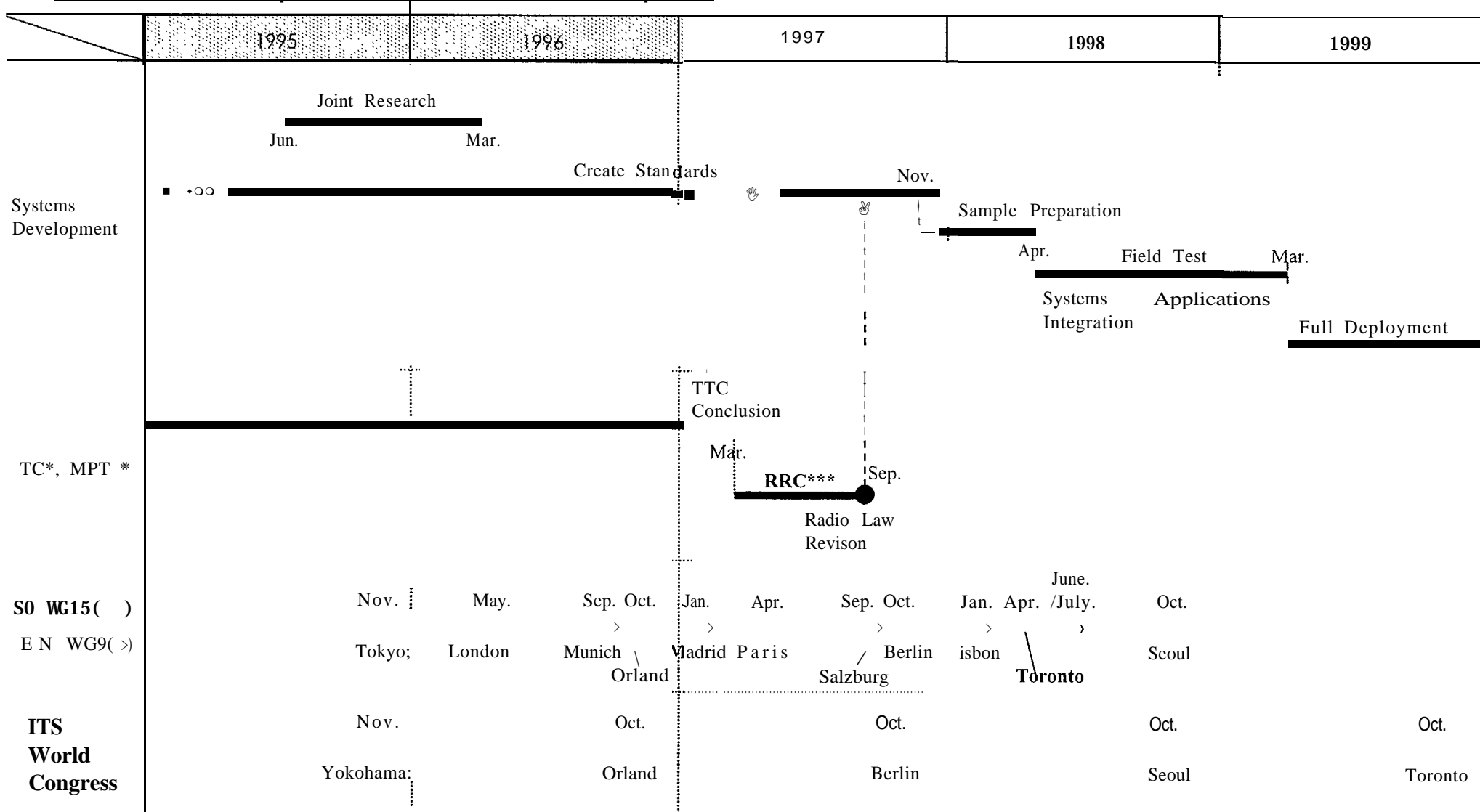L1 5 8GHz(1) (CEN)   L1 Infrared   L1 5.8GHz(2) (Japan)   L1 915MHz   L1 5 8GHz(3) (USA)

ISO/TC204/WG15/Radio Comm. G. Committee of Japan

Goal

- Interantional Harmonization on DSRC standards
  - North America (U.S., Canada, Mexico)
  - Europe<CEN>
  - Japan

ISO/TC204/WG15/Radio Comm G. Committee of Japan

I

DSRC Development Schedule in Japan

	1995	1996	1997	1998	1999

Systems Development

Joint Research
Jun.   Mar.

Create Standards   Nov.

Sample Preparation
Apr.   Field Test   Mar.

Systems Integration   Applications

Full Deployment

TC*, MPT

TTC Conclusion
Mar.

RRC***   Sep.
Radio Law Revison

SO WG15( )
E N WG9(>)

Nov.	May.	Sep. Oct.	Jan.	Apr.	Sep. Oct.	Jan. Apr.	June. /July.	Oct.

Tokyo;   London   Munich   Madrid Paris   Berlin   isbon   Seoul
Orland   Salzburg   Toronto

ITS World Congress

Nov.	Oct.	Oct.	Oct.	Oct.
Yokohama	Orland	Berlin	Seoul	Toronto

Ver 4.2 December 17, '97   **ISO/TC204/WGl5/Radio Comm. G., Committee of Japan**

Paper 123

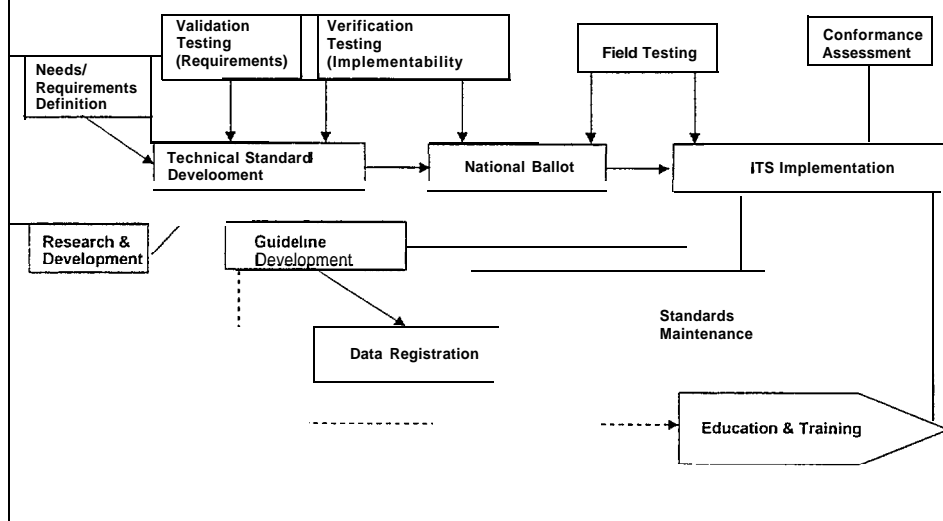# Processes for Implementing Standards – USA

Mike Schagrin

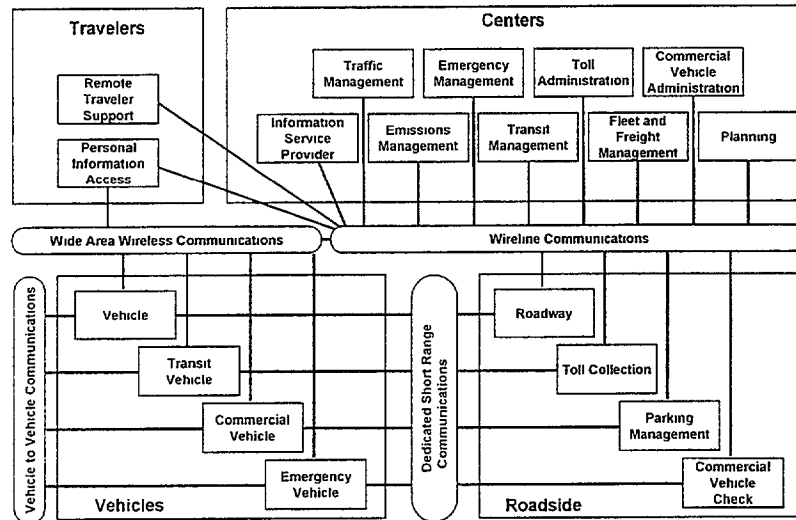# The Intelligent Transportation System Standards Program

Mike Schagrin

US Department of Transportation
ITS Joint Program Office

Standards Lifecycle Activities

The National ITS Architecture

Types of Standards

- Communications
  - DSRC, FM Subcarrier, NTCIP
- Foundation Elements
- Application Specific
  - Data Dictionaries and Message Sets
  - ATMS, ATIS, APTS, CVO
- Safety and Human Factors

Federal Facilitation

- Preliminary Standards Work
  - Draft Standards
- Public Sector Participation
  - State and local participation
- Test & Evaluation
  - Laboratory vs Field test
- International Harmonization
  - ISO TC 204, TC 22, TC 211

The Council of Standards Organizations

- ITS America
- USDOT
  - JPL, Mitretek, ORNL, APL
- NIST
- TIA

- AASHTO
- ASTM
- IEEE
- ITE
- SAE

- The CSO provides:
  - Oversight coordination
  - A forum for addressing cross-cutting issues

Testing

- Validation - It meets user requirements
- Verification - Products can be built
- Laboratory - Integration testing
- Field testing - Operational experience
- Product conformity assessment
- What level of testing needs to be accomplished?
- What are the roles and responsibilities of the various organizations?
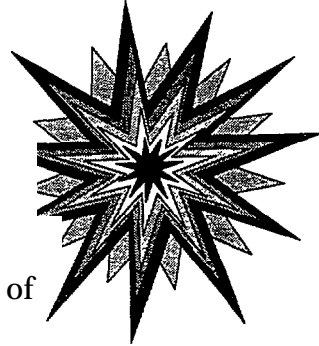
Data Registration

- **A tool/process for:**
  - **establishing baselines**
  - **resolving conflicts**
  - **facilitating reuse of data**
- *A key to supporting interoperability across applications*

Maintenance

- Defined as:
  - Interpretation and defect management
  - Technical revision
  - Periodic review
- Each SDO assumes ownership and therefore, the maintenance responsibility

Education

- **Awareness seminars**
- **Guidance documents**
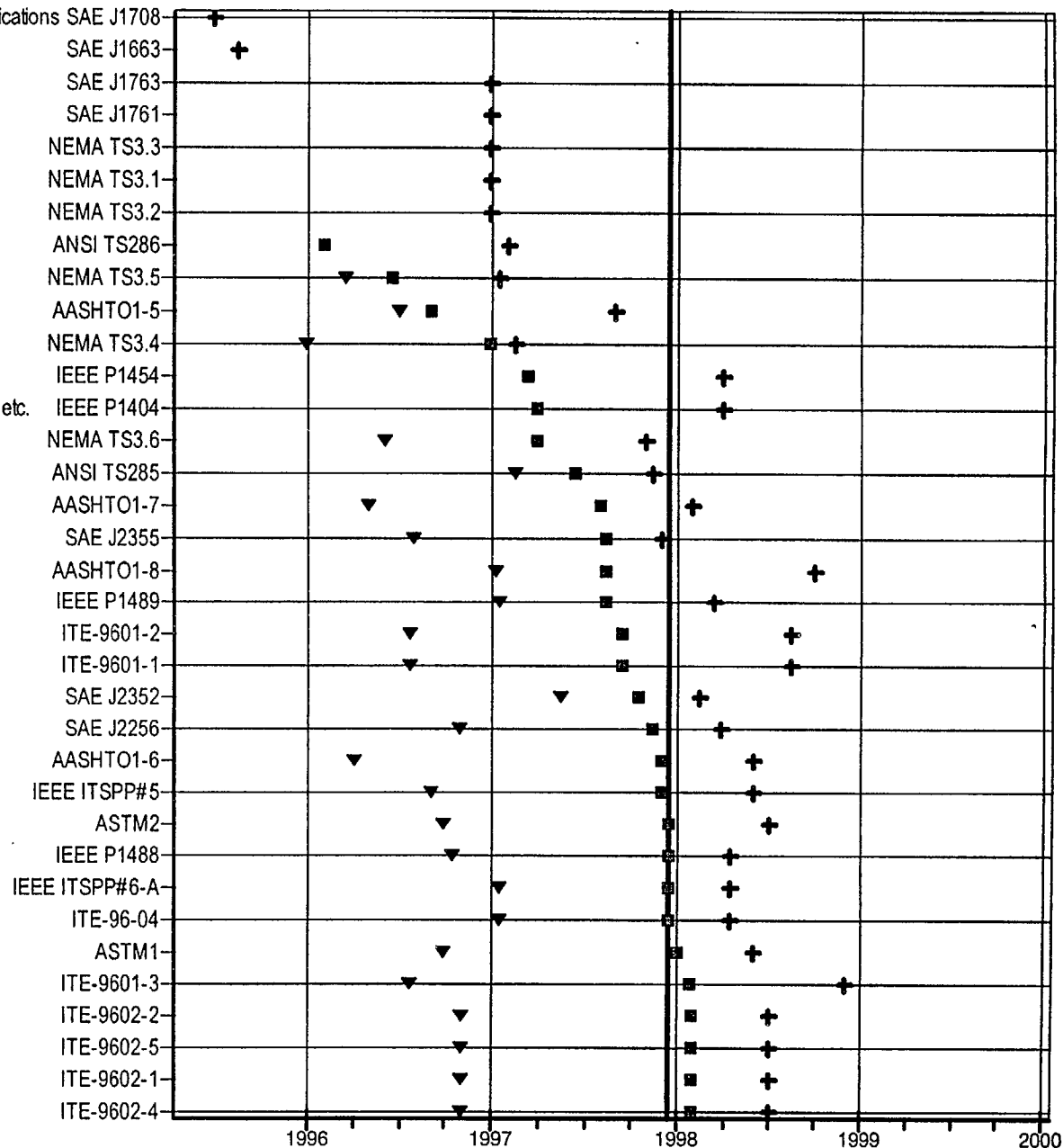- **Formal training courses**
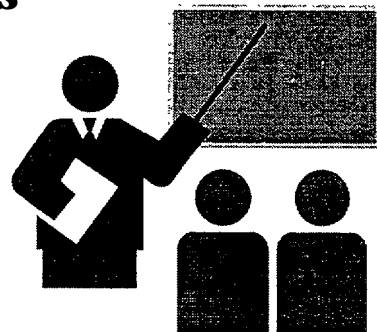
Implementation

- Putting standards into practice
- What have we learned, so far, from early implementors?
- How good do the standards have to be?
- How are we going to deal with legacy systems?
- Where should interoperability requirements be addressed?

Summary

- Is the standards development process sufficient?
- What level of testing is necessary to ensure "good" standards and facilitate implementation needs?
- Are there significant issues relating to legacy systems?
- What needs to be done to facilitate implementation from both the public agency and private industry perspectives?
- Which standards should we be trying to harmonize at an international level?
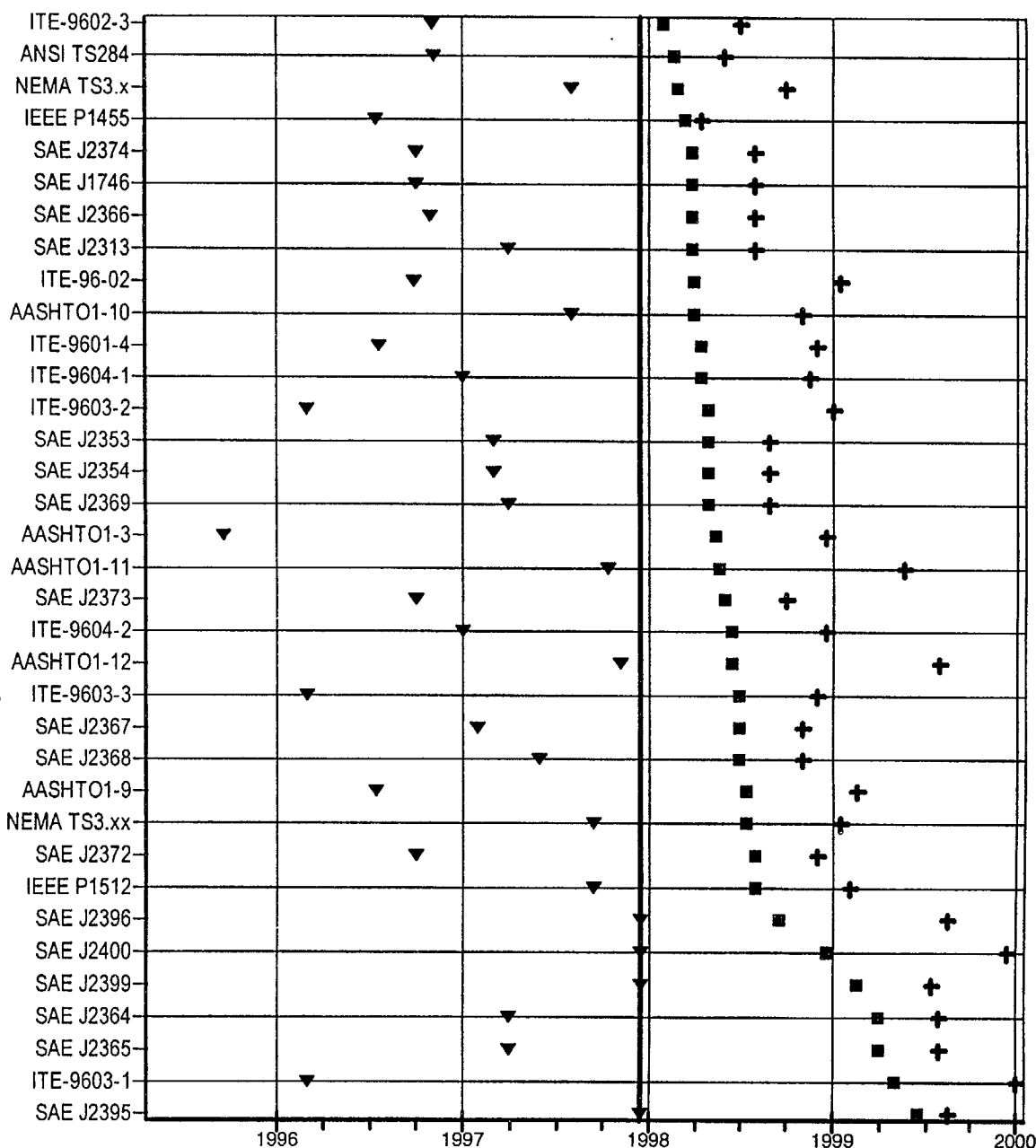
Standards Development Milestones - Ordered by Proposed Date

Standard	ID
Serial Data Comm. Between MicroComputer and Heavy Duty Vehicle Applications	SAE J1708
Truth in Labeling Standard for Navigable Map Databases	SAE J1663
A Conceptual ITS Architecture: An ATIS Perspective	SAE J1763
Information Report on ITS Terms and Definitions	SAE J1761
NTCIP Class B Profile	NEMA TS3.3
NTCIP Overview	NEMA TS3.1
NTCIP Simple Transportation Management Protocol	NEMA TS3.2
CVO - Credential Application	ANSI TS286
Actuated Signal Controller Objects (NTCIP)	NEMA TS3.5
Video Camera Control (NTCIP)	AASHTO1-5
Global Object Definitions (NTCIP)	NEMA TS3.4
Selection and Installation of Fiber Optic Cable in ITS	IEEE P1454
Microwave Comm. Sys. Development Design, Procurement, Construction, etc.	IEEE P1404
Dynamic Message Signs (NTCIP)	NEMA TS3.6
Commercial Vehicle Safety and Credentials Information Exchange	ANSI TS285
Environmental Sensor Stations (NTCIP)	AASHTO1-7
ITS Data Bus Architecture Information Report	SAE J2355
Weigh-in-Motion (NTCIP)	AASHTO1-8
Standard for Data Dictionaries for ITS	IEEE P1489
ATMS Data Dictionary (TMDD) - Section 2 (Incidents)	ITE-9601-2
ATMS Data Dictionary (TMDD) - Section 1 (Links/Nodes)	ITE-9601-1
Mayday Industry Survey Information Report	SAE J2352
In-Vehicle Nav & ATIS Comm Device Msg Set Std	SAE J2256
Highway Advisory Radio (HAR - NTCIP)	AASHTO1-6
Survey of Communications Technologies	IEEE ITSPP#5
DSRC Data Link Layer	ASTM2
Standard for Message Set Template for ITS	IEEE P1488
ITS Data Dictionaries Guidelines	IEEE ITSPP#6-A
Message Set for External TMC Communications	ITE-96-04
DSRC Physical Layer - 902 - 928 MHz	ASTM1
ATMS Data Dictionary (TMDD) - Section 3 (traffic control)	ITE-9601-3
TCIP - Public Transit Vehicle Message Set	ITE-9602-2
TCIP - Remote Traveler Support Message Set	ITE-9602-5
TCIP - Transit Data Dictionary	ITE-9602-1
TCIP - Transit Management Center to External Center Message Set	ITE-9602-4

Timeline: 1996 — 1997 — 1998 — 1999 — 2000

Legend:
▼ Begin Standards Dev.   + Published Standard
■ Proposed Standard

JPL

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Standards Development Milestones - Ordered by Proposed Date

Standard	Code
TCIP - Transit Vehicle to Transit Management Center Message Set	ITE-9602-3
Commercial Vehicle Safety Reports	ANSI TS284
Advanced Sensors (NTCIP)	NEMA TS3.x
Message Sets for DSRC for ETTM and CVO	IEEE P1455
National Location Referencing Information Report	SAE J2374
ISP-Vehicle Location Referencing Standard	SAE J1746
ITS Data Bus Protocol Standard	SAE J2366
On-Board Land Vehicle Mayday Reporting Interface	SAE J2313
Transit Communications Interface Protocols	ITE-96-02
Video Detection Devices (NTCIP)	AASHTO1-10
ATMS Data Dictionary (TMDD) - Section 4 (DMS/Video/etc)	ITE-9601-4
Message Set for External TMC Communication (MS/ETMCC) - Bundle A	ITE-9604-1
Advanced Transportation Controller (ATC) Cabinet Specification	ITE-9603-2
Advanced Traveler Information System (ATIS) Data Dictionary	SAE J2353
Advanced Traveler Information System (ATIS)Core Message List	SAE J2354
ATIS Message Structure for High Speed FM Subcarrier	SAE J2369
Ramp Meters (NTCIP)	AASHTO1-3
Vehicle Classification Devices (NTCIP)	AASHTO1-11
LRS Stakeholder's Workshop Information Report	SAE J2373
Message Set for External TMC Communication (MS/ETMCC) - Bundle B	ITE-9604-2
Automatic Vehicle Identification (NTCIP)	AASHTO1-12
Advanced Transportation Controller (ATC) functionality and interface definitions	ITE-9603-3
ITS Data Bus Gateway Recommended Practice	SAE J2367
ITS Data Bus Conformance Testing Standard	SAE J2368
Class E Profile for Center to Center Communications (in NTCIP)	AASHTO1-9
NTCIP Profiles	NEMA TS3.xx
LRS Field Test Analysis Information Report	SAE J2372
Message Sets for Incident Management (EMS to TMC, E911)	IEEE P1512
Visual Demand Management	SAE J2396
Forward Collision Warning: Operating Characteristics and User Interface	SAE J2400
Adaptive Cruise Control MMI and Operating Characteristics	SAE J2399
Navigation & Route Guidance Function Accessibility while Driving	SAE J2364
Navigation & Route Guidance Man-Machine Interface Transactions	SAE J2365
Advanced Transportation Controller (ATC) Application Program Interface	ITE-9603-1
In-Vehicle Message Priority	SAE J2395

Legend:
▼ Begin Standards Dev.   + Published Standard   ■ Proposed Standard

JPL